NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

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DESIGN AND IMPLEMENTATION OF A
PROTOTYPE DATABASE FOR THE ANALYSIS
OF STUDENT OPINION FORMS FOR THE
ADMINISTRATIVE SCIENCES DEPARTMENT,
NAVAL POSTGRADUATE SCHOOL,
MONTEREY, CALIFORNIA

by

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September 1989

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This thesis develops a prototype database for the analysis of Student Opinion Forms (SOFA) for the Administrative Sciences Department using FOCUS database management system. It will be used to retrieve SOF data and to produce reports and graphics which will assist the chairman, his representatives, and department researchers in examining the historical data relating to courses, curricula or instructors.

SOFA will greatly assist department personnel in making reasonable inferences regarding instructor performance, classroom environment, student curriculum and other factors which may be affecting the learning environment.

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by

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Submitted in partial fulfillment
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ABSTRACT

The Naval Postgraduate School currently collects and disseminates the data from Student Opinion Forms (SOF) on a quarterly basis. After all required SOF reports are routed to the academic departments and the instructors, the data is archived on magnetic tape. Until recently, there was no method of retrieving this data for use in classroom environment research or for instructor evaluation purposes.

This thesis develops a prototype database for the analysis of Student Opinion Forms (SOFA) for the Administrative Sciences Department using FOCUS database management system. It will be used to retrieve SOF data and to produce reports and graphics which will assist the chairman, his representatives, and department researchers in examining the historical data relating to courses, curricula or instructors.

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Additionally, thanks to Craig and Eleanor. If laughter is still the best medicine, they will always keep me healthy!

I. DEFINITION PHASE

A. BACKGROUND

At the end of each quarter, the students at the Naval Postgraduate School (NPS) are given the opportunity to make comments and forward suggestions on the quality of instruction, course content and environmental issues for each course they attend.   In order to facilitate this process, Student Opinion Forms (SOF) were developed. These machine-scanable forms contain sixteen questions dealing with different aspects of the above-mentioned issues. Additionally, there are provisions on the form for up to four pertinent write-in questions that the department or individual instructor may deem appropriate.   For each question there are five spaces numbered 1 to 5 and an additional space labeled N/A provided. The student reads the question and then responds by filling in one of the spaces, with 1 being the lowest rating and 5 being the highest rating. The N/A space is reserved for no comment. On the back of the form the student can add comments in a hand-written format.   These comments are intended for the exclusive benefit of the instructor and are not to be read by the department chairman or any other members of the faculty or the school administration.   The instructor is prohibited from being present or attempting to influence the

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students at the time the SOFs are being completed. After students complete their SOFs, they are sent to CTB/McGraw-Hill. McGraw-Hill is a certified testing firm which accepts automated testing results nationwide. They scan the SOFs and organize the data based on user criteria, and transfer the results to magnetic tape. The entire process requires two to three weeks or longer before the results are made available to instructors or department chairmen. Periodically, the questionnaires are reviewed by the NPS faculty Advisory Board to insure their validity.

NPS has saved Student Opinion Form (SOF) results dating back to the Summer Quarter of 1977. This data is currently stored and maintained by the computer center. These tapes contain SOF numbers as the sole identifier of each record. Following each quarter, the department head receives a transmittal sheet which indicates which professors are associated with specific SOF numbers and an overall breakdown of the department scores from the computer center. The computer center also provides each instructor with a breakdown of SOF scores for each course that he taught in the previous quarter. Each instructor tracks his own scores and has the option of presenting them to promotion boards and the department chairman when receiving annual reviews. The transmittal sheets are the only source of information that associates SOF ID numbers to instructors and courses; there is no computer record containing this information.

The current system provides department heads with only raw data and no method of performing statistical analysis on the data. This data consists of a relative frequency distribution of responses received for each question, with the mean and standard deviation associated with the question. As an example, the data for a question will appear similar to the following:

```
                                   N/A   1    2    3    4    5
1. The course was well organized    0   .03  .07  .11  .39  .40

                    Mean 4.07    SD 1.02
```

Figure 1. SOF Question Example

This is shown for each question on the SOF. No system exists which will allow the chairman or researchers to apply statistical analysis to the new data (i.e., multiple regression analysis).

B. PROBLEM DEFINITION

The problem is developing a system that will enable authorized faculty to manipulate the data in a timely fashion in order to make reasonable inferences regarding issues such as instructor performance, classroom environment and textbooks. It must be emphasized that the system must control access to SOF data that can be associated with individual instructors in order to protect individual

privacy. Additionally, the steering committee requires a system that will enable them to manipulate the data in order to make reasonable inferences regarding instructor performance, classroom environment, textbooks, etc. The following is a sampling of problems and possible queries:

- <u>Problems</u>:

    - Failure to account for all the variables in the classroom environment that influence SOFs beyond instructor effectiveness

    - Inappropriateness of SOF data storage for research and instructional enhancement, as well as instructor evaluation

    - Redundancy of existing SOF questions

- <u>Query Samples</u>:

    - What are the SOF scores by professor?

    - What are the SOF scores by course?

    - What are the SOF scores by student group (i.e., class, course, etc.)

    - How does an instructor's overall SOF mean compare with the value expected for the course and curriculum group taught, as well as the class size and length of time the instructor has been at NPS?

    - In what specific areas does an instructor have problems?

    - What changes in "performance" (as measured by other information on SOF forms) explain changes in (a professor's) SOF scores (in a specific course)?

    - What is the correlation of the scores on SOFs with grades in a course?

    - What difference does the use of SOF median rather than a mean make in any of the above?

    - What changes in class "environment" (size, location etc.) explain differences in SOF scores?

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C. SCOPE OF THE PROJECT

The system will provide the following functions:

- Creation of a prototype database using an Object Oriented methodology for all Administrative Sciences faculty to support Student Opinion Form analysis. Object Oriented methodology will be discussed in more detail in the Design Phase (Chapter III) of this thesis.

Specifically, the system will:

- Provide for expeditious entry of the quarterly SOFs into the database.

- Quickly associate an instructor by name and code with the SOF results of the course(s) he is teaching.

- Isolate individual classes, specifying the number of students in the class, and each student's curriculum.

- Aggregate faculty SOF statistics to include mean and median for individual courses taught, for all courses taught, and to investigate any pertinent relationships that may exist between various environmental aspects of the class size, instructor methods, and the student inputs recorded on the SOFs.

- Generate reports which will assemble the data concerning courses, curriculum and instructors on demand.

    - Instructor SOF scores (individual course)

    - Instructor SOF scores (entire quarter)

    - Instructor SOF breakdown (entire history at NPS)

    - Raw data print out for statistical purposes

- Provide two-dimensional line graphs designed to furnish easy visual references to developing trends in the short run and depict long run trends as well.

The primary user of the system will be the Administrative Sciences Department Chairman and the department associate chairmen acting on his behalf. Additionally, designated individuals will use the system as an analysis tool. The anticipated maximum number of users

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at any given time will be five to six persons. Data-entry personnel will be assigned by the Administrative Sciences Department head.

D. FEASIBILITY

Preliminary interviews with the Administrative Science Department steering committee for the SOF Data Project and an initial analysis of the size of the project indicated that the project was technically feasible, easily affordable and can be accomplished within the time available for the project.

- <u>Technical Feasibility</u>: There are some technical issues which should be addressed with regard to the feasibility of the project. Considering the current and future amount of data storage required, this system could be developed on a micro-computer using Dbase III or a similar software package. However, since the project will be designed for a user group and no local area network exists, it was decided to proceed with the development on the IBM 3033 mainframe. All the users have mainframe accounts and can easily access the program and the data after logging on in the usual manner.

- <u>Cost Effectiveness</u>: By using existing facilities, the cost of system development can be kept to only the man-hours required during the development process. Also, by developing menu-driven applications and help facilities, very little user training will be necessary.

- <u>Scheduling</u>: Although always valuable and in short supply, time should not be a major source of difficulty if managed properly.

II. <u>REQUIREMENTS PHASE</u>

Identifying the user's requirements involves two goals: 1) Identifying data requirements (i.e., what data must be stored in the database in order to satisfy user information needs), and 2) Identifying functional requirements (i.e., the update, display and control mechanisms for the applications that will use the database). In this thesis, we adopt an "Object Oriented" approach to specify user requirements, whereby, in the data requirements phase, entities in the user's work environment such as the department, an instructor or a SOF form are represented by objects and in the functional requirements phase, the update, display and control mechanisms are determined for these objects. In the next section, we describe in detail the user's data requirements, and in the following section we describe the user's functional requirements.

A. DATA REQUIREMENTS

In order to determine the data requirements for an application, the objects in the user's environment must be identified and their structure defined. An object is a named collection of properties that sufficiently describes an entity in the user's work environment, such as the SOF form, instructor, department or a course. A characteristic that does not help to fill the information needs of the

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users will not be included in a sufficient description. For example, the brand of personal computer used in the department office is not required to meet the users information needs for SOFA.

An **instance** of an object is a representation of one particular entity. For example, an instance of the course object would be IS-2000 and of the department object would be Administrative Sciences Department. These are representations of actual entities in the users environment.

Objects have names that distinguish them from other objects and correspond with the entities they represent (i.e., in SOFA, Department Object). Each property of an object represents a characteristic of the entity it represents. In the Department Object, there is a Chairman property and a department code property. This collection of properties must be a **sufficient description** of the real world entity. In other words, not every characteristic of an entity must be included to accurately portray that entity for the user. As an example, there is no need to know the color of the department head's hair. It is sufficient that his name be included in the object.

Objects can have properties that are actually other objects. These are called **object properties**. In the SOFA application, the Department Object has the Instructor Object as one of its properties. Finally, properties can be **single**

or **multi-valued**. Single valued properties are properties which are allowed to have at most one value for a given instance. For example, the Department Object has a department code property. There can be only one code number associated with a department instance. However, there are many instructors associated with a single department. Therefore, the Instructor Object property is multi-valued. Non-object properties as well as object properties can be multi-valued.

In order to summarize what is known about an object and to document the design of objects clearly, we use object diagrams. In an object diagram, a box is drawn to represent an object with its name appearing beneath it. The properties of the object are listed inside the box. Non-object properties are presented in lower-case letters. Object properties appear in upper-case letters, enclosed by a smaller box. If the property (non-object or object) is a multi-valued property, they will have the characters "mv" next to them.

After meeting with the SOFA Steering Committee, it was determined that the data needs of the users could be met by defining five objects using the object oriented methodology outlined above. They are the SOFS, Subsof, Department, Instructor and Courses Objects. These objects are depicted in Appendix A.

The SOF Object represents the aggregate evaluation of students for a class. The SOF Object consists of three single-valued properties (the Sofno, Quarter and the Year), two single-valued object properties (the Instructor Object and the Course Object), and one multi-valued object property, (the Subsof Object). It contains all data relevant to uniquely identify SOF number instances.

The SUBSOF Object represents the SOF forms filled out by the students in each class. It consists of twenty four single-valued properties, representing the data fields on the SOF forms, including the subsof number which uniquely identifies the individual forms. The Subsof Object also has one single-valued object property, SOF.

The COURSE Object represents the courses taught by course number and section, and the quarter and year in which they were offered. It consists of six single-valued properties and one multi-valued object property.

The DEPARTMENT Object represents the academic department. It consists of three single-valued properties and one multi-valued object property. This object uniquely identifies a department by its code number and its department name.

The INSTRUCTOR Object represents individual instructors working in a department. The Instructor Object consists of two single-valued properties, one object property and one multi-valued object property. Additionally, it has a

confidential code property which permits access to SOF data associated with the instructor without revealing the identity of the instructor. Detailed object specifications are shown in Appendix B.

B. FUNCTIONAL REQUIREMENTS

Having defined the objects to be stored in the database in the previous section, the second goal of the Requirements Phase is to identify the functional requirements of the system. Based on the needs of the users, all applications must be identified and their update, display and control mechanisms defined. In order to determine the organization business functions, that is, how the organization creates, edits, deletes and displays objects, as well as who is authorized to do so, the data flow diagram approach was used.

Dataflow Diagrams (DFD) clearly identify and trace the flow of data and reports through a system. They also identify the work performed by computers and personnel along the way. In a DFD, the emphasis is placed on processes. Processes transform input data flows into output data flows and are represented by circles. It is not necessary to show the transformation processes. The parallel lines depict the databases, which are the collections of data used and maintained by the system. The squares (or rectangles) on the DFD represent external entities in the system's environment that input data to the system or receive

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information from the system. They define the boundaries of the system. Finally, the named arrows depict the data flows. Dataflows can depict reports, forms, entries, updates and any other data or information flow.

Referring to the Dataflow Diagram in Appendix C, the Student Opinion Form process begins when the students fill out the computer scanable forms. This is accomplished for each class, every quarter. The SOFs are collected and turned over to the computer center. At this point the computer center turns the forms over to an outside contractor (CTB/McGraw-Hill, at present) who scans the documents and stores the data on magnetic tape in a fixed file, alphanumeric format.

NPS computer center personnel are obliged, by Privacy Act requirements, to separate the data into two fixed-format files on computer center disks. The header data file contains instructor names, department code, quarter and year data and a course SOF number, as well as a count of the students who responded, and the SOF data file contains all the scanable information on the SOF form. The computer center transfers copies of these files to the department's mainframe account and maintains their own copy intact for three months. After this period, the header data is erased and the SOF data is archived to magnetic tape.

At this point, the department personnel assigned to maintain the SOFA database receive the SOF and header data

and perform a menu driven software routine which loads the quarterly transactions into the SOF and Instructor files. The Course database information originates in the NPS Registrar's office. The Registrar passes course information to the department, and the course name and number as well as the SOF number assigned by the registrar for each quarter that the course was taught is stored by department personnel. Information pertaining to the department and instructors which is already maintained by the department is entered into the database. All data elements required for SOFA are now located in the database and are ready to be used for SOFA reporting purposes.

In order to produce the reports and graphics, data from the SOF Object is retrieved and the following outputs are generated on screen or in hard-copy form:

- Instructor Quarterly, Cumulative and Yearly SOF Breakdown Reports

- Instructor Graphics which plot the Question 12 average, Curriculum comparison, and Overall Comparisons

- Course Quarterly, Yearly and Historical reports

- Department Summary report, Department Currriculum Comparison graphic, and overall Department Comparison graphic

- Focus Course, Course/Curriculum, and Department statistical analysis

- Quarterly, yearly and cumulative Raw Data retrieval.

These outputs are available to the department chairman or to the associate chairmen and to authorized research

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personnel. Complete descriptions of the Update, Display and Control Mechanisms are contained in Appendix D.

III. DESIGN PHASE

During the Requirements Phase, the data needs of the users were identified and their structure defined using a named collection of properties called objects. During the logical design, these objects are transformed into a "relational database" design. This relational design can be directly implemented using a "relational database" or converted to a "hierarchical" or "network" database design for implementation using a "hierarchical" or "network" database. During the application design, the data flow diagram in Appendix C is transformed into menus and pseudo code for use during the implementation of SOFA. A brief discussion of objects, relations and the SOFA object-to-relation transformation follows.

A. RELATIONAL DATABASE DESIGN

All of the objects in SOFA are compound objects. A **Compound Object** contains at least one object property, and will be represented by at least two relations, one for the object and one for each object property. They are transformed into relations by defining one relation for the object itself, and another relation for each of the object properties.

In a relational database design, objects are transformed into a two dimensional table called a relation. Each

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relation is equivalent to a file, and each row (or tuple) is a record. This record is made up of one or more data items or attributes. The attributes are the columns of the relation table. It is these relations that provide the data to create objects in the logical design of the database. Attributes in a relation must be single-valued with no repeating groups or arrays. Entries in any column are all of the same kind and have a unique name. In a relation, no two rows may be the same. Each row has one or more attributes which uniquely identify that row. These attributes are called **keys**. All relations must have at least one key. The relationship between all the SOFA objects is one-to-many (1:N). A department (on the 1 side) may have an instructor, but this is not required. This is an optional relationship and is indicated by the circle next to the instructor relation. However, an instructor (on the N side) must have a department to be included in the database. For a one-to-many relationship, the key of the parent relation (the relation on the 1 side) is placed as a foreign key in the child relation (the relation on the N side). Each relationship is subject to optional or mandatory constraints. Referring to Appendix E, a mandatory constraint results when the existence of one relation requires the prior existence of another relation. For the Instructor relation to exist, there must be a Department relation. On the relational diagram, this is indicated by a

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line (or bar) near the Department relation. The Department relation, however, can exist without the presence of an Instructor relation. This is an **optional** relationship and is indicated by the circle near the Instructor relation. Refer to the Object Diagrams in Appendix A and the Relational Diagram in Appendix E for the following discussion.

1. SOFA Object Transformation into Relations

a. Department

The Department Object is transformed into a relation having three attributes: department code, department name and the chairman. The key to the department relation is the department code, which uniquely identifies the department.

b. Instructor

The Instructor Object is transformed into a relation consisting of the following attributes: lastname, code, initials, userid, SOF number, quarter, year and SOFkey. A foreign key attribute, department code, is also included. The key to the Instructor relation is lastname. Userid is the user's mainframe password and has been included to be used later for database security development.

c. Courses

The Courses Object is transformed into a relation consisting of the following attributes: the course, quarter and year attributes which uniquely identify

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a course instance and are used as the key. The SOF number attribute is included to associate the class with all SOF numbers it has been assigned. A segment attribute is included in order to differentiate between sections of a class offered in the same quarter. The final two attributes are the Course name and the SOFkey attributes.

     d. SOFs

The SOFs Object is transformed into a relation which consists of the SOF number, quarter and year attributes. Together, these three attributes uniquely identify a SOF instance and are used as the key. There are also two foreign key attributes: last name from the Instructor relation and course from the Courses relation.

     e. SubSOF

The SubSOF Object is transformed for each student in the class into a relation which consists of the following attributes: the sub SOF number, student's curriculum, hours-this-quarter, quarters completed, required field and Question 1 to Question 20. The key of the SubSOF relation is the subsof number. The foreign keys are SOF number, quarter and the year.

  2. <u>SOFA Relationships</u>

The relationships in SOFA are all one-to-many (1:N). This means that a record of one type (called the **parent**) is associated with many records of another type (called the children). In a relational diagram, the relationship is

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indicated by placing the key of the parent as an attribute of the child. In the relational diagram in Appendix E, this is also shown by the line originating at the department and terminating with a fork in the line being attached to the instructor relation, indicating many instructors associated with the department.

- The relationship between the Department and the Instructor relationship is a one-to-many (1:N) relationship. This is a mandatory relationship and is indicated by the bar near the department relation.

- The relationship between the Instructor and the SOFs relations is a one-to-many (1:N) relationship, with the Instructor (the 1 side) having an optional relationship with the SOFs relation (the N side). An instructor teaches a number of courses over time. During a research quarter he or she may not teach any courses. Therefore, it is an optional relationship.

- The relationship between Courses and SOFs is a one-to-many (1:N) relationship with Courses as the one and SOFs as the many. A course may not be offered in a given quarter. In this case a course would not require a SOF number. However, in order for a SOF number instance to exist, there must be a course associated with it. For this reason, there is a bar near the courses relation indicating this mandatory relationship.

- The SOFs and SubSOF relationship is also a one-to-many (1:N) with the SOFs (on the 1 side) having many Subsofs. Each SOF instance represents a class and each SubSOF represents an actual SOF form filled out by a student in the class. Since a SOF may have a subsof number, but a sub SOF must have a SOF the relationship is an mandatory to optional one.

Once the relations and the network have been defined, the "blueprint" for the database has been completed and the support for the application design is in place.

B. APPLICATION DESIGN

An application is the user's interface with the database. It should be easy to use, allow access by authorized users and accommodate authorized requests with accurate data. A usable application should serve three functions:

- It prints, queries, and updates objects.
- It allows the user to direct and control the processing of the application.
- It maintains the security and integrity of the database at all times.

1. Scope of Applications

SOFA consists of two applications: the Database Maintenance Application, which includes all the add and modify functions of the various objects in the database; and the Output Generator Application, which includes all the reporting functions.

The Database Maintenance Application requires access to the Department, Instructor and Course objects. The personnel required to enter the data must be authorized by the chairman to access the database. Once authorized access, the data entry personnel will be able to access the Instructor object in order to enter new instances, or modify fields in instances. No Instructor instance can be deleted. Similarly, the Department Object can be accessed by authorized users and instances added. The stored Department instances can be accessed, but only certain fields can be

modified. No Department instances can be deleted. Course instances may be accessed by authorized users and, as before, the stored Course instances may be accessed and modified, but not deleted. Since one of the user requirements of SOFA is to analyze historical data, no portions of it are to be deleted.

The Output Generator application is comprised of two main functional areas, the Administrative Review and Statistical Analysis. The Administrative Review functions allow an instructor and the chairman or his authorized representatives to produce printed reports of instructor, course and department SOF data. Access to the SOF object is required to produce the reports created by Administrative Review. This view requires that the user inputs query data such as instructor code and quarter, year and course number and produces reports of quarterly, yearly and cumulative SOF data breakdowns for individual instructors, for the department as a whole, or for a specified course. The user has the option of selecting graph functions, which produce graphics of the results sought, or curriculum comparisons for both the department and the instructor.

Statistical Analysis uses the SOFs and SubSOF objects to produce files containing raw SOF data for export to the user's own account, or for a raw data report. Additionally, the Focus Analyze option allow users to query

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the SOFs and SubSOF objects and perform menu-driven statistical operations on that data.

2. Control Mechanisms

The use of FOCUS at NPS has been limited, with predominant utilization by personnel from the Registrar's Office. Although it is relatively easy to acquire the skills to produce basic reports using FOCUS, users are unable to justify devoting the personal resources required to learn a new set of commands because of its limited value to their needs.

Considering the requirements of the users, and the relatively infrequent use of the system by any one user, it was decided that a menu driven system combined with forms and masks to access and input data and produce reports would be the optimal design for optimum use of the system, for minimizing training requirements, and insuring that accurate data is maintained.

3. Menu Hierarchy Description

During the Requirements Phase, the Data Flow Diagram in Appendix C indicating the user's functional requirements is constructed. In the Application design these functional requirements are converted into a functional hierarchy (Appendix F) which corresponds to the menus used to run SOFA. Every effort was made to perform the three major functions outlined above through the use of menus, on-screen forms.

Initially, the user executes the SOFA program and the Main Menu will appear (Figure 3.1). The Main Menu allows the user to select a major functional area of operation: Administrative Review, Statistical Analysis, or Updates.

```
┌─────────────────────────────────────┐
│                SOFA                  │
│             MAIN MENU                │
├─────────────────────────────────────┤
│                                      │
│      1.  ADMINISTRATIVE REVIEW       │
│                                      │
│      2.  STATISTICAL ANALYSIS        │
│                                      │
│      3.  UPDATES                     │
│                                      │
│      4.  HELP                        │
│                                      │
│      5.  EXIT PROGRAM                │
│                                      │
│  MAKE SELECTION AND PRESS ENTER:     │
└─────────────────────────────────────┘
```

Figure 3.1. Main Menu

Selecting the Administrative Review will cause another menu to appear which will allow the user to conduct an administrative analysis of instructor data, perform course summaries or examine department data (Figure 3.2). The Administrative Review menu guides the user through a series of menus and on-screen forms to produce reports and graphs based on the Department, Instructor, Course, SOFs and Subsofs objects (Appendix A).

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```
            ┌─────────────────────────────────────┐
            │              SOFA                   │
            │        ADMINISTRATIVE REVIEW        │
            ├─────────────────────────────────────┤
            │  1.  INSTRUCTOR DATA AND ANALYSIS   │
            │  2.  COURSE SUMMARY                 │
            │  3.  DEPARTMENT DATA                │
            │  4.  EXIT TO PREVIOUS MENU          │
            │   MAKE SELECTION AND PRESS ENTER:   │
            └─────────────────────────────────────┘
```

Figure 3.2. Administrative Review Menu

Selecting the Statistical Analysis option from the
Main Menu will produce another menu which will allow the
user to produce a printout of either raw data for export to
another statistical package or allow the user to utilize the
statistical ability of FOCUS by following on-screen forms
and prompts (Figure 3.3).

```
            ┌─────────────────────────────────────┐
            │              SOFA                   │
            │            STATISTICS               │
            ├─────────────────────────────────────┤
            │    1.  RAW DATA RETRIEVAL           │
            │    2.  FOCUS ANALYZE                │
            │    3.  EXIT TO PREVIOUS MENU        │
            │   MAKE SELECTION AND PRESS ENTER:   │
            └─────────────────────────────────────┘
```

Figure 3.3. Statistics Menu

Finally, if the user selects Updates from the Main Menu, the Updates Menu is presented (Figure 3.4). This menu will allow authorized users to update the database with instances of new departments, courses and instructors, as well as giving the user the ability to modify certain portions of existing records. These updates will be controlled by the use of on-screen forms which mask the inputs to insure appropriate data is entered. Masking is the process of controlling inputs by allowing only certain characters in a specific format to be input.

```
┌─────────────────────────────────┐
│             SOFA                │
│            UPDATES              │
├─────────────────────────────────┤
│                                 │
│   1.  ADD INSTRUCTOR            │
│   2.  MODIFY INSTRUCTOR         │
│   3.  ADD DEPARTMENT            │
│   4.  MODIFY DEPARTMENT         │
│   5.  ADD COURSE                │
│   6.  MODIFY COURSE             │
│   7.  EXIT TO PREVIOUS MENU     │
│ MAKE SELECTION AND PRESS ENTER: │
└─────────────────────────────────┘
```

Figure 3.4. Updates Menu

Samples of all on-screen forms and actual or facsimile reports are reproduced in Appendix H. The logic

for materializing the objects from data in the database is reproduced in Appendix G in the form of pseudo code. The pseudo code maintains enough generality to allow the logic to be implemented in any database management system.

4. Lower Level Materialization

Each of the lower level options are numbered in accordance with the SOFA menu hierarchy in Appendix F, and with the pseudo code in Appendix G. All screens, forms and reports are reproduced in Appendix H. Due to the physical size of the reports, they will not be seen on the screen but will be routed to the printer.

a. 1.1.1 Instructor Quarterly SOF Breakdown

When this option is selected, the user is presented with a form which provides prompts to enter the instructor code, the quarter and the year. When the user enters the data, the screen clears and the processing begins. The report lists the course, and the number of respondents by curriculum and the questions with their associated data. It is then routed to the printer. The user is unable to modify the database. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

b. 1.1.2 Instructor Cumulative SOF Breakdown

This option is selected from the Instructor Data/Analysis menu. The user is presented with a form which prompts for the input of the instructor code, the year or "all" for all data on the instructor in the database. After the user enters the data, the screen clears and the processing begins. The report lists the quarter, course, SOF number, the average of Questions 1 to 11 with its median, and the average of Question 12 and 13 with their medians. It is then routed to the printer. The user is unable to modify the database. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

c. 1.1.3 Instructor Yearly SOF Breakdown

When this option is selected the user is presented with a form which provides prompts to enter the instructor code and the year. When the user enters the data, the screen clears and the processing begins. The report heading lists the courses, together with the number of respondents by curriculum, and the body of the report displays the SOF questions and lists their associated data to the right of the question. It is then routed to the printer. The user is unable to modify the database. If

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incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

d. 1.1.4.1 Specified Question Graphs

This option is selected from the Graphs Menu of the Instructor Data/Analysis Menu. The user is presented with a form which prompts for the instructor code and the question number. When the user enters the data, processing begins and the output is sent to the printer. The result is a two dimensional line graph with the question number printed across the top and the quarter and year labels on the X axis. The Y axis is labeled from 0 to 5 and the mean and median for the requested question is plotted over time. The instructor's name is printed below the graph. If incorrect data is entered on the query form, the report will be routed but there will be no data manipulation. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

e. 1.1.4.2 Curriculum Comparison Graphs

After selecting this option from the Instructor Data/Analysis Graph Menu, the user is presented with a form which prompts for the instructor code and the desired curriculum numbers. When the user enters the data,

processing begins and the output is sent to the printer. The result is a two-dimensional line graph with the curriculum numbers printed across the top heading and the quarter and year labels on the X axis. The Y axis is labeled from 0 to 5 and the Question 12 mean for each curriculum is plotted over time. The instructor's name is printed below the graph. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

      f. 1.1.4.3 Overall Comparison Graphs

This option is selected from the Graph Menu of the Instructor Data/Analysis Menu. The user is presented with a form which prompts for the instructor code and the current year. When the user enters the data, processing begins and the output is sent to the printer. The result is a two-dimensional line graph with the heading printed across the top and the quarter and year labels on the X axis. The Y axis is labeled from 0 to 5 and the average of Questions 1 to 11 and the average of Question 12 is plotted over time. The instructor's name is printed below the graph. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity

considerations. This report will be accessible to the chairman and authorized representatives only.

g. **1.2.1 Quarterly Course Summary**

This option is selected from the Course Summary Menu. The user is presented with a form which prompts for the course number the quarter and the year. After the user enters the data, processing begins and the report is routed to the printer. The report displays the quarter, the year and the course number and counts the respondents by curriculum. The main body of the report lists the SOF number, the instructor code, the average and median of Questions 1 to 11 and the average and median of Questions 12 and 13 for each SOF number associated with the course. If incorrect data is entered on the query form, the report will be routed but there will be no data manipulation. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

h. **1.2.2 Yearly Course Summary**

This option is selected from the Course Summary Menu. The user is presented with a form which prompts the user to enter the course number and the year. After the user enters the data, processing begins and the report is routed to the printer. The report heading displays the course number and the year and counts the respondents by curriculum. The main body of the report lists the SOF

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number, the instructor code, the average and median of Questions 1 to 11 and the average and median of Questions 12 and 13 for each SOF number associated with the course. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

i. 1.2.3 Historical Course Summary

This option is selected from the Course Summary Menu. The user is presented with a form which prompts for the course number. After the user enters the data, processing begins and the report is routed to the printer. The report heading displays the course number and counts the respondents by curriculum. The main body of the report lists the SOF number, the instructor code, the average and median of Questions 1 to 11 and the average and median of Questions 12 and 13 for each SOF number associated with the course. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

j. 1.3.1 Administrative Sciences Department Summary

After selecting this option from the Department Data Menu, the user is presented with a form which prompts

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for the department code number, the quarter and the year.
When the user enters the data, processing begins. The
report heading lists the quarter, the number of SOF numbers
and the number of respondents. In the body of the report,
questions are listed along with their associated data. It
is then routed to the printer. The user is unable to modify
the database. If incorrect data is entered on the query
form, the report will be routed but there will be no data
retrieved. Since the database remains unaffected, there are
no integrity considerations. This report will be accessible
to the chairman and authorized representatives only.

k. 1.3.2 Curriculum Comparison Graph (Department)

This option is selected from the Department Data
Menu. The user is presented with a form which prompts for
the department code, the year and the desired curriculum
numbers. When the user enters the data, processing begins
and the output is sent to the printer. The result is a two
dimentional line graph with the curriculum numbers printed
across the top heading and the quarter and year labels on
the X axis. The Y axis is labeled from 0 to 5 and the
Question 12 mean for each curriculum is plotted over time.
The department name is printed below the graph. If
incorrect data is entered on the query form, the report will
be routed but there will be no data retrieved. Since the
database remains unaffected, there are no integrity

considerations. This report will be accessible to the chairman and authorized representatives only.

l. 1.3.3 Overall Comparison Graph (Department)

This option is selected from the Department Data Menu. The user is presented with a form which prompts for the department code and the current year. When the user enters the data, processing begins and the output is sent to the printer. The result is a two dimentional line graph with the heading printed across the top and the quarter and year labels on the X axis. The Y axis is labeled from 0 to 5 and the average of Questions 1 to 11 and the average of Question 12 is plotted over time. The department name is printed below the graph. If incorrect data is entered on the query form, the report will be routed but there will be no data retrieved. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman and authorized representatives only.

m. 2.1.1 Quarterly Raw Data Retrieval

This option is selected from the Raw Data Retrieval Menu. The user is presented with another menu which asks if a printout is desired or if an export file is desired. After the user selects an output option, a form which prompts for the department code, the quarter and year is displayed. When the user enters the data, processing begins and a report is routed to the printer or stored in

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the user's files as an EBCDIC file. The report heading
displays the department name, the quarter and the year. The
body of the report prints out the raw data from each
question on each SOF along with the quarter, instructor
code, SOF number, curriculum and class size for each SOF
number. If incorrect data is entered on the query form, the
report will be routed but there will be no data retrieved.
Since the database remains unaffected, there are no
integrity considerations. This report will be accessible to
the chairman and authorized representatives only.

n. 2.1.2 Yearly Raw Data Retrieval

This option is selected from the Raw Data
Retrieval Menu. The user is presented with a menu which
asks if a printout is desired or if an export file is
desired. After the user selects an output option, a form
which prompts for the department code and year is displayed.
When the user enters the data, processing begins and a
report is routed to the printer or stored in the user's
files as an EBCDIC file. The report heading displays the
department name and the year. The body of the report prints
out the raw data from each question on each SOF along with
the quarter, instructor code, SOF number, curriculum and
class size for each SOF number. If incorrect data is
entered on the query form, the report will be routed but
there will be no data retrieved. Since the database remains
unaffected, there are no integrity considerations. This

report will be accessible to the chairman and authorized
representatives only.

o. 2.1.3 Cumulative Raw Data Retrieval

This option is selected from the Raw Data
Retrieval Menu. The user is presented with a menu which
asks if a printout is desired or if an export file is
desired. After the user selects an output option, a form
which prompts for the department code is displayed. When
the user enters the data, processing begins and a report is
routed to the printer or stored in the user's files as an
EBCDIC file. The report heading displays the department
name. The body of the report prints out the raw data from
each question on each SOF along with the quarter, instructor
code, SOF number, curriculum and class size for each SOF
number. If incorrect data is entered on the query form, the
report will be routed but there will be no data retrieved.
Since the database remains unaffected, there are no
integrity considerations. This report will be accessible to
the chairman and authorized representatives only.

p. 2.2.1 Course Focus Analyze

This option is called from the Focus Analyze
Menu. The user is presented with a form which prompts for
the quarter and the year and the course. When the user
enters the data, processing begins. The processing will
produce raw data consisting of the responses to the SOF
questions and save it in a temporary file. Then the Focus

Analyze facility is called to perform menu-driven statistical analysis on the data. Currently, there is no hard copy printout available for this process. If incorrect data is entered on the query form, an empty file will be temporarily stored. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman, his authorized representatives and personnel assigned to do research with the data.

q. 2.2.2 Course/Curriculum Focus Analyze

This option is called from the Focus Analyze Menu. The user is presented with a form which prompts for the curriculum number, course number, quarter and the year. When the user enters the data, processing begins. The processing will produce raw data consisting of the responses to the SOF questions and save it in a temporary file. Then the Focus analyze facility is called to perform menu driven statistical analysis on the data. Currently, there is no hard copy printout available for this process. If incorrect data is entered on the query form, an empty file will be temporarily stored. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman, his authorized representatives and personnel assigned to do research with the data.

r. 2.2.3 Department Focus Analyze

This option is called from the Focus Analyze Menu. The user is presented with a form which prompts for

the department code, quarter and the year. When the user enters the data, processing begins. The processing will produce raw data consisting of the responses to the SOF questions and save it in a temporary file. Then the Focus analyze facility is called to perform menu driven statistical analysis on the data. Currently, there is no hard copy printout available for this process. If incorrect data is entered on the query form, an empty file will be temporarily stored. Since the database remains unaffected, there are no integrity considerations. This report will be accessible to the chairman, his authorized representatives and personnel assigned to do research with the data.

      s. 3.1 Add Instructor

      This option is called from the Update Menu. The user is presented with a form which will create a new instructor instance in the database. The user enters the department code, the instructor's last name, instructor's initials, and the confidential code assigned by the department head. When the fields are correct and the user enters them, the transaction is matched against the database. If there is no match, a new instance is created. If there is a match, the transaction in rejected. Data integrity is maintained via format and masking. The format of the field is controlled by defining the fields as alphanumeric in the Department Master file. Any numeric inputs will not be accepted. The field length is controlled

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by masking the fields on the form. They are allocated a specific number of characters, beyond which the cursor will move to the next field. No attempt has been made to control the input beyond this. If the user enters incorrect data that meets these criteria, an incorrect record will be in the database, and data integrity may be compromised. This operation will be performed by the chairman or an authorized representative.

t. 3.2 Modify Instructor

This option is called from the Update Menu. The user is presented with a form which will prompt for the instructor's last name, confidential code, and the department code. When the fields are correct and the user enters them, the matched instance will be displayed on the screen as it is stored in the database. Only the instructor code field can be modified. When the appropriate change to the field has been made and verified correct, the user enters the data and the instance has been modified. Data integrity is maintained via format and masking. No attempt has been made to control the input beyond this. If the user enters incorrect data that meets these criteria, an incorrect record will be in the database, and data integrity may be compromised. This operation will be performed by the chairman or an authorized representative.

u. 3.3 Add Department

This option is called from the Update Menu. The user is presented with a form which will create a new department instance in the database. The user enters the department code, the department name and the chairman's name. When the fields are correct and the user enters them, the transaction is matched against the database. If there is no match, a new instance is created. If there is a match, the transaction in rejected. Data integrity is maintained via format and masking. All fields must be alphanumeric. The length is controlled by the field masking. No attempt has been made to control the input beyond this. If the user enters incorrect data that meets these criteria, an incorrect record will be in the database, and data integrity may be compromised. This operation will be performed by the chairman or an authorized representative.

v. 3.4 Modify Department

This option is called from the Update Menu. The user is presented with a form which will prompt for the department code. The matched instance will be displayed on the screen as it is stored in the database. Only the chairman field can be modified. When the appropriate changes to the fields have been made and verified correct, the user enters the data and the instance has been modified. Data integrity is maintained via format and masking. All

fields must be alphanumeric. The length is controlled by the field masking. No attempt has been made to control the input beyond this. If the user enters incorrect data that meets these criteria, an incorrect record will be in the database, and data integrity may be compromised. This operation will be performed by the chairman or an authorized representative.

w. 3.5 Add Course

This option is called from the Update Menu. The user is presented with a form which will create a new course instance in the database. The user enters the new course number and name. When the fields are correct and the user enters them, the transaction is matched against the database. If there is no match, a new instance is created. If there is a match, the transaction in rejected. Data integrity is maintained via format and masking. All fields must be alphanumeric. The length is controlled by the field masking. No attempt has been made to control the input beyond this. If the user enters incorrect data that meets these criteria, an incorrect record will be in the database, and data integrity may be compromised. This operation will be performed by the chairman or an authorized representative.

x. 3.6 Modify Course

This option is called from the Update Menu. The user is presented with a form which will prompt for the

course number, the quarter and the year. The matched instance will be displayed on the screen as it is stored in the database. When the appropriate changes to the fields have been made and verified correct, the user enters the data and the instance has been modified. Data integrity is maintained via format and masking. All fields must be alphanumeric. The length is controlled by the field masking. No attempt has been made to control the input beyond this. If the user enters incorrect data that meets these criteria, an incorrect record will be in the database, and data integrity may be compromised. This operation will be performed by the chairman or an authorized representative.

IV. IMPLEMENTATION

A. INTRODUCTION

During the Requirements Phase of SOFA system development, the first task to be accomplished was to define user data requirements. This was done using the Object Oriented methodology described in Chapter III. The second task of the Requirements Phase was to determine the functional requirements of the users. This was done by using the Data Flow Diagram methodology. During the Logical Design Phase, objects developed in the user's requirements phase were transformed into a relational design, and binary relationships were developed. During the application design, the DFDs were used to create menus and their associated programs written in pseudo-code to provide for the update, display and control of the data. During Implementation, these designs are implemented into programs, forms, reports and printouts which provide the user with the means to perform update, display and control operations.

For the SOFA project requirements, there was a need to provide service to a number of users in the Administrative Sciences Department. Since there are no local area networks linking the users and the application, it was decided to use the school's mainframe computer since all potential users have, or can acquire, accounts on it. The mainframe is

currently running only one database management system, FOCUS.

B. FOCUS AND THE SOFA SCHEMA

FOCUS is a fourth generation language (4GL) and database management system which combines an English-like, nonprocedural language with a database that supports both relational and hierarchical structures. In a hierarchical data model, relationships must be predefined and established by data structures such as indexes or linked lists. This type of model is very efficient for batch processing, but it does not provide for the interactive query capability of a relational model. In order to gain the advantages of a relational system, FOCUS includes the ability to join database files to facilitate interactive query applications. For this reason, the hierarchical file structure was adapted to the standard relational database methodology which was required to develop SOFA applications. These variations will be pointed out wherever they are relevant to the reader's understanding of the implementation process.

In the relational model, to represent the objects defined in the user requirements, the objects would be converted to relations using rows (tuples) to represent records and columns (attributes) to represent fields. These relations are joined using common fields to materialize the objects. This is the main area where implementation required some deviation from relational methodology. FOCUS

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organizes database records using the hierarchical model, representing binary relationships through the use of master files (Appendix I). Each master file uses segments to represent objects. The segments consist of fields which are the logical equivalent of the attributes of the relation. Segments and their fields are associated with the record by pointers. The record contains a parent (root) segment and pointers which identify the children. In FOCUS the child segment contains an identifier field called "Parent" (Appendix I). This parent field signifies to FOCUS that this segment is a child of the segment indicated in the parent field. To the application user this is transparent.

The binary relationship between the Department and the Instructor objects is represented in FOCUS by the Department Master file (Appendix I). The Department Master file is used to store all data related to the department including data about the instructors. The Department segment is the root segment containing fields which describe the department. Each department contains many instructors (a one-to-many relationship); consequently, the Instructor object is represented by the Instructor segment using the parent field to indicate that its parent is the Department. This segment contains a field segment SOFkey, which is a concatenation of the Sof number, quarter and year fields and is used to "join" the Department file with the other files

on the SOFA database. More will be mentioned about this field later.

The Courses Object is represented by the Courses master file (Appendix I). It contains only one segment called Courses. The Course segment contains all fields required to uniquely identify a course and the quarter and year it was offered, as well as the SOF number assigned to it. The Course segment also has a SOFkey field consisting of a concatenation of SOF number, quarter and year.

The binary relationship between the SOFs Object and the SubSOF Object is one-to-many and represented by the SOFs Master file. The Sof segment describes the SOF object and contains the SOFkey field, which as before, is the concatenation of Sof number, quarter and year. The Subsof number is the second segment in the SOFS master file and represent the Subsof object. This segment is the child of the SOF segment as indicated by the parent field.

The resulting implementation, therefore, consists of three master files which represent the five SOFA objects. In order to create a relational environment, these files must be joined together by matching a common field. The SOFkey field in all three master files was created for this purpose. Issuing a join command on the SOFkey field will enable the SOFA program to access any of the fields in any of the files on an ad hoc basis. The appearance of this arrangement in an application is the same as that which a

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relational database provides in the menu-driven SOFA environment. For objects to be created in FOCUS, files are joined to each other using common key fields, much the same as in a truly relational database. The resultant hybrid (relational/hierarchical) tree structure is depicted in Appendix E, which was created in FOCUS to logically match the relational design.

C. MENU HIERARCHY

The menu hierarchy was implemented using the FOCUS dialog manager facility and FOCUS executable files called Focexecs. Dialog Manager statements were used to control the sequence of FOCUS commands and Focexecs which comprise SOFA. By using the Dialog Manager, the user is able to provide variable values when prompted.

Each menu offers the user a choice of options. An option is selected by entering the number. This number is a FOCUS local variable which selects and executes a specific Focexec file. When execution is completed the user is returned to the current menu. This occurs with minimum user inputs.

D. SOFA APPLICATIONS

1. Reports and Graphics

The SOFA reports for raw data retrieval and administrative review, including instructor, course and department data were created using the Dialog Manager

facility for querying the database and the FOCUS Table facility. The Table facility encompasses a less structured, English-like nonprocedural request language which provides for field selection, establishment of screening criteria and specifying how the data is to be summarized, as well as report headings and footings.

Graphs are produced of instructor and department data using a command set nearly identical to the Table report writer, and graph queries are accomplished using the Dialog Manager.

FOCUS Analyze outputs are created using the Analyze facility. It provides a set of statistical tools that consist of simple to moderately complex analytical functions, and it prompts the user for the required parameters. See Appendix H for facsimile menus outputs and Appendix J for a tutorial on producing reports and graphs.

2. Updates

Adding or modifying records in SOFA is accomplished using FOCUS Modify. Modify is a nonprocedural language which allows users to input or modify records from any of the SOFA files via menu driven, on-line formatted screens. The SOFA user matches on records using the Dialog Manager facility. When a record is displayed the user tabs from field to field, makes the required changes, and then enters the data. At this point the record is modified. If it is a new record, a blank form is presented and the user completes

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the fields and enters a new record. FOCUS will display a count of accepted and/or rejected transactions.

3. Database Maintenance

Each quarter, new SOF and instructor data must be entered into the SOFA database. A Focexec file was created which allows data entry personnel to enter the data in a menu-driven, interactive mode, using a combination of the Dialog Manager and the Modify Facility in a batch processing mode. The user will execute the FOCUS file and will be prompted for the file names of the new data. After entering the file names the program will find the files in the CMS directory and read them into the SOFA database. When all files are read in, FOCUS will provide a transaction report which indicates how many records were accepted into the database.

E. SOFTWARE DOCUMENTATION

1. User's Manual

The user's manual for SOFA was written for users who have a basic background in IBM CMS operating systems. This is most important for accessing the software, executing the program, for producing the reports and clearing the screen. All function keys used in SOFA are explained in the manual as well as a brief explanation of the statistical analysis tools available in the FOCUS Analyze module.

2. Main Program

SOFA is actually a collection of executable files which perform much like procedures and functions used in structured, procedural languages like Pascal. The code is too voluminous to include in the appendix, but it can be accessed using both Xedit in CMS and the Ted facility in FOCUS.

F. REPORTING

With SOFA, all applications with the exception of statistical functions produce off-line reports. The reason for this exception was that the size and complexity of the reports precluded their being displayed on standard terminal screens. The reports were modeled on reports that the users currently receive. The graphic outputs are newly developed and are simple two-dimensional line graphs.

V. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The SOFA program has great potential to be a valuable tool to the academic departments at Naval Postgraduate School. The ability to examine the historical data of Student Opinion Forms and make comparisons involving class environmental issues could have a substantial impact on future students and faculty, as well as the utilization of class space and course materials.

B. CONCLUSIONS

1. SECURITY ISSUES

Considering the use of SOFA data for evaluating an instructor's effectiveness, great care must be taken to insure that only authorized personnel are able to access the database. There exists a real moral and legal (Privacy Act) obligation to protect the privacy of the individual instructor, as well as to protect the corporate data of the department. Presently, SOFA's only security is the department chairman's mainframe account number and the associated read only password. While this is adequate at the prototype stage, it is wholly inadequate for the production software, should the project gain acceptance. FOCUS offers data security features in conjunction with its Database Administration and Master Files, and programming

logic could be adapted to meet security requirements. These issues should be thoroughly investigated and implemented by follow-on research.

2. Database Maintenance

It will be no small matter to maintain the database. Each quarter, personnel must be assigned to perform the following:

- Insure that computer center personnel transfer the files to the department head's account
- Insure that the instructor names and confidential codes are correct
- Enter all new faculty into the database
- Run the database maintenance executable file to load the new quarter data
- Run the program as required by direction of the chairman.

It will require diligence on the part of clerical personnel to make the project work. Consideration should be given to further automation of the SOFA project by screening for and automatically adding new instructors and courses during the quarterly updates to help minimize the data-entry personnel workload.

3. About FOCUS

FOCUS is a fourth generation language (4GL) which is richly endowed with many valuable features. It is a highly rated product, and in the hands of experienced programmers it can be very powerful. However, it is not recommended that a novice user attempt to learn FOCUS without the

assistance of the training programs offered by Information Builders, Inc. The sheer size of the product as well as its wide array of facilities, requires the new user to seek assistance of experienced and knowledgeable FOCUS consultants or programmers to gain the basic skills required to produce a logical and appropriate schema and an efficient, succinct, well-written program.

C. RECOMMENDATIONS

Although a great deal of time and effort have been expended to date, there is a great deal more that can be done which would allow the SOFA Project to evolve into an even more useful product. Some suggested actions are:

- Enlist one or more thesis students to accomplish, at a minimum, the following:

  - Review the SOFA documentation for consistency and completeness

  - Convene with the SOFA steering committee to insure that SOFA is meeting user requirements

  - Develop comprehensive testing and validation procedures

  - Perform required updates and maintenance which may be uncovered by testing and user requests.

The above actions will help ensure a usable system which would be an asset to the department, while providing valuable data for ongoing research.

APPENDIX A

SOFA OBJECT DIAGRAMS

Instructor

- lastname
- code
- DEPARTMENT
- SOFS mv

Department

- department code
- department name
- chairman
- INSTRUCTOR mv

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Course

| sof number |
| quarter |
| year |
| course |
| segment |
| course name |

| SOFS |
mv

Sofs

| sof number |
| quarter |
| year |

| INSTRUCTOR |

| COURSE |

| SUBSOF |
mv

Subsof

| subsof number |
| curriculum |
| hours-this-quarter |
| quarters-completed |
| question 1 |
| . |
| . |
| question 20 |

| SOFS |
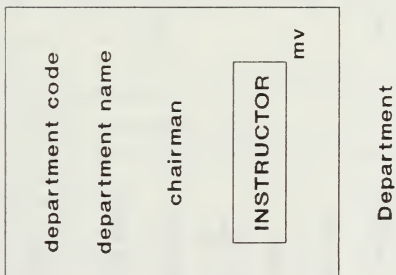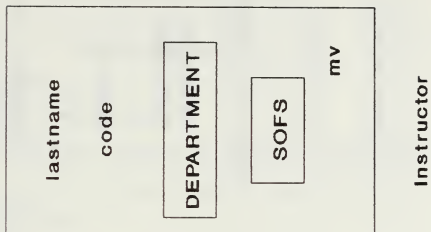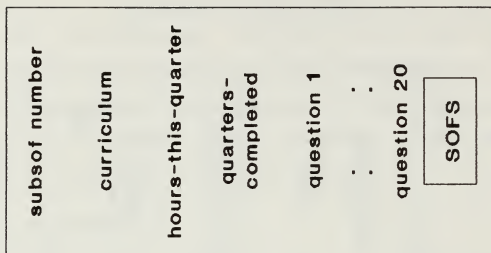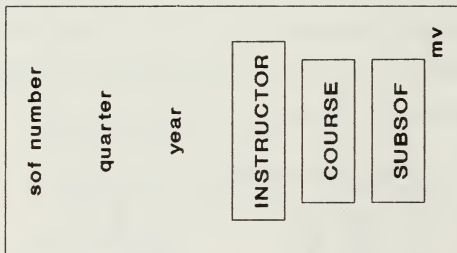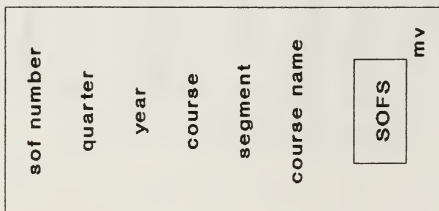
APPENDIX B

SOFA OBJECT SPECIFICATIONS

Object Definitions

DEPARTMENT OBJECT
department code; NPS-dept
department name; course-name
chairman; sof-names
INSTRUCTOR; INSTRUCTOR object; MV; SUBSET [lname, code,init]

INSTRUCTOR OBJECT
last name; sof-names
code; inst-code
DEPARTMENT; DEPARTMENT object; SUBSET [code]
SOFS; SOFS object; MV SUBSET [sofno, quarter, yr, course]

COURSE OBJECT
sof number; sof-num
quarter; quarter
year; year
course; course-number
segment; segment
csname; course-name
SOFS; SOFS object; MV SUBSET [sofno, quarter, yr]

SOFS OBJECT
sof number; sof-num
quarter; quarter
year; year
INSTRUCTOR; INSTRUCTOR Object
COURSE; COURSE Object
SUBSOF; SUBSOF Object; MV SUBSET [ssofno]

SUBSOF OBJECT
subsof number; ssof-num
curriculum; curriculum
quarter; quarter
hours-this-quarter; hours-this-quarter
quarters-completed; qtrcomp
required; required-class
question 1; response
    .   .
    .   .
question 20; response
SOFS; SOFS object;

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Domain Definitions

sof - names;
      Text 12

sof - initials;
      Text 3

NPS - dept;
      Text 2, mask CC
      where CC is department code

inst - code;
      Text 3, mask CCC
      where CCC is the individual instructor's personal
      code for SOF access purposes. Hides the name from
      unauthorized users.

sof - num;
      Text 3, mask CCC
      where CCC is a 3 digit number representing the
      associated course for the given quarter

ssof - num;
      Text 3,
      mask CCC where CCC is a 3 digit number representing an
      individual associated with the given sof/course number

curriculum;
      Text 3, mask CCC
      where CCC represents the 3 digit curriculum number of
      the student filling out the sof form

hours - this - quarter;
      numeric 2, mask NN
      the number of hours of instruction the student filling
      out the sof is completing during the current quarter

required - class;
      logical C
      where C is one boolean character y,n,t,f which
      indicates whether this course associated with the sof
      is required

response;
      numeric 1, mask N
      where the digit is between 0 to 5 indicating a
      student's response to a question on the sof

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<u>course - number</u>;
    Text 6, mask CCCCCC
    where CC is the department offering the course, CCCC
    is the course number

<u>segment</u>;
    Text 2,
    where the digits represent different class sections

<u>course - name</u>;
    Text 30
    the semantic title of the course

<u>quarter</u>;
    Text 1, mask C
    where C is a single digit (eg. '1' for Fall, '2' for
    Winter, '3' for Spring, '4' for Summer)

<u>year</u>;
    Text 2, mask CC
    where CC is the last two digits of the year

<u>section - number</u>;
    Text 1; mask -C
    where C is the single digit section number

<u>qtrcomp</u>;
    Numeric 1; mask N
    where N is the number of quarters the student has
    completed

APPENDIX C

SOFA OBJECT DATA FLOW DIAGRAM
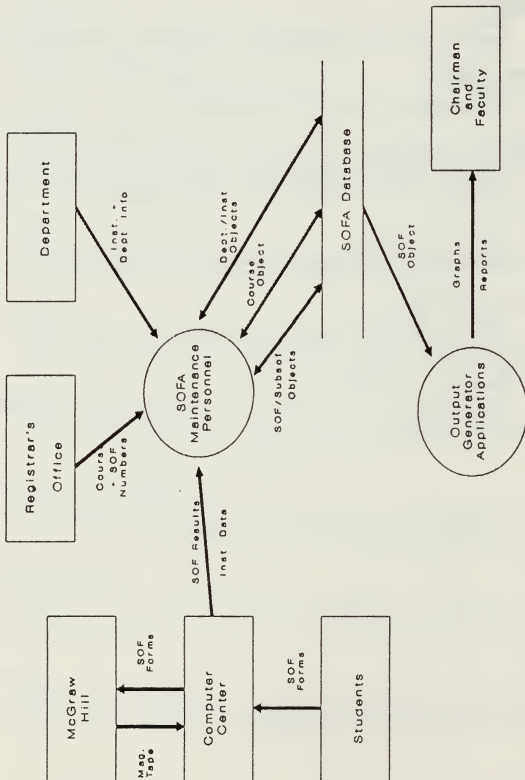
APPENDIX D

SOFA UPDATE, DISPLAY AND CONTROL MECHANISMS

COURSE UPDATE MECHANISMS

I. Add new COURSE data

    A. Inputs

        1. COURSE information from registrar

        2. Course number and name keyed in by entry clerk

    B. Outputs

        1. New COURSE instance in database

    C. Processing Notes

        1. Personnel must be assigned to enter data

    D. Volume

        1. 2 to 3 new entries annually

    E. Frequency

        1. Once per quarter

II. Add SOF data to COURSE

    A. Inputs

        1. COURSE object instance from database

        2. Data from registrar

        3. Key in SOF number, quarter and year

    B. Outputs

        1. COURSE object instance form for editing

        2. Amended COURSE instance

     C. Processing Notes

         1. Personnel must be assigned to enter data

     D. Volume as required

     E. Frequency as required

III. Add SEGMENT data to COURSE

     A. Inputs

         1. COURSE object instance from database

         2. Data from registrar

     B. Outputs

         1. COURSE object update form

         2. Amended COURSE instance

     C. Processing Notes

         1. Personnel must be assigned to enter data

     D. Volume as required

         E. Frequency as required

COURSE Control Mechanisms

  I. Password access only to COURSE, and SOF databases

 II. Forms provide masked entry spaces only

I. Add SOF instances

    A. Inputs

        1. SOF database data (fixed files)

    B. Outputs

        1. Transaction confirmation screen

    C. Processing Notes

        1. Data entered into the department's mainframe
           account (on disk) by the computer center
           (from magnetic tape)

        2. Data entry personnel load from disk account
           into dbms files.

    D. Volume approximately 1100 records per quarter

    E. Frequency is quarterly

SOF Display Mechanisms

I. Query on SOF

    A. Outputs

        1. Reports displaying SOF information

           a. Instructor Quarterly, Cumulative and
              Yearly SOF Break Down Reports

           b. Course Quarterly, Yearly and Historical
              reports

           c. Department Summary report

           d. Focus Analyze Course, Course/Curriculum,
              and Department statistical analysis

           e. Quarterly, yearly and cumulative Raw Data
              retrieval

       2. Graphs displaying SOF trend information

          a. Instructor Graphics which plot the Question 12 average, Curriculum comparison, and Overall Comparisons

          b. Department Currriculum Comparison graphic, and overall Department Comparison graphic

B. Source data

    1. SOFA database

C. Processing Notes

    1. Users will initiate the processing via menu driven applications

D. Volume as needed

E. Frequency as needed

SOF Control Mechanisms

  I. Data entry and updates accomplished and verified by software routine on approval of the department head.

     1. Inputs for files are fixed form, and screened by software routine.

     2. Modifications are performed via forms and masking.

 II. Password access, read only authorization

III. Editing by unauthorized users will not be allowed

DEPARTMENT Update Mechanisms

I. Edit DEPARTMENT instance

    A. Inputs

        1. DEPARTMENT database

        2. Data from the department manual records

    B. Outputs

        1. Form display of department instance

        2. Transaction confirmation screen

    C. Processing Notes - access by chairman or his representative only

    D. Volume as needed

    E. Frequency as needed

II. Add DEPARTMENT instance

    A. Inputs

        1. Data from the department manual records

    B. Outputs

        1. Inputs form displayed

    C. Processing Notes

        1. Personnel must be assigned to enter data

    D. Volume as required

    E. Frequency as required

DEPARTMENT Control Mechanisms

    I.   Password access to chairman's account to query

   II.   Password required to chairman's account to add or edit instances

 III.   Forms and masking will control data entry

INSTRUCTOR Update Mechanisms

    I.   Add INSTRUCTOR instance

       A.   Inputs

           1.   The department provides new instructor data from manual records

           2.   DEPARTMENT database provides department data

       B.   Outputs

           1.   New instructor instance in database

           2.   Transaction confirmation screen

       C.   Processing Notes - access limited to the chairman and his representatives

       D.   Volume as needed

       E.   Frequency as required

   II.   Modify INSTRUCTOR instance

       A.   Inputs

           1.   DEPARTMENT database

           2.   Instructor code keyed in by operator

       B.   Outputs

           1.   Modified data on instructor

           2.   Transaction confirmation Screen

C. Processing Notes - access limited to chairman or his representatives

D. Volume as required

E. Frequency as needed

III. Query INSTRUCTOR object

A. Inputs

1. Instructor name or code#

B. Outputs

1. Screen of INSTRUCTOR instance

C. Processing Notes

1. Instructor codes must remain confidential

2. Access to instructor data will be restricted to the Chairman or his representatives

D. Volume as required

E. Frequency as needed

INSTRUCTOR Control Mechanisms

I. Chairman's password will be required to access system and any sensitive data

II. Forms and masks will control data entry

APPENDIX E

SOFA RELATIONAL DIAGRAM

Department
| depcode | .. |

Instructor
| lname | depcode | .. |

SOFS
| sofno | quarter | yr | course | depcode | lname | .. |

Courses
| course | quarter | yr | sofno | .. |

Subsof
| ssofno | sofno | quarter | yr | course | depcode | lname | ... |

APPENDIX F
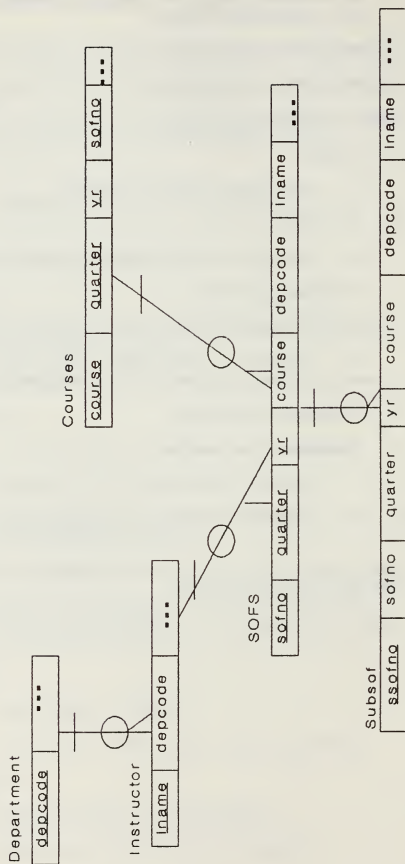
SOFA PROJECT MENU HIERARCHY

ADMINISTRATIVE REVIEW
1

INSTRUCTOR DATA / ANALY
1.1

QUARTERLY SOF BREAKDWN
1.1.1

CUMULATIVE SOF BRKDWN
1.1.2

YEARLY SOF BREAKDOWN
1.1.3

GRAPHICS
1.1.4

EXIT
1.1.5

COURSE SUMMARY
1.2

QUARTERLY
1.2.1

YEARLY
1.2.2

HISTORICAL
1.2.3

EXIT
1.2.4

DEPARTMENT DATA
1.3

ADMIN SCI DEPT SUMMARY
1.3.1

CURRIC COMP GRAPHIC
1.3.2

OVERALL COMP GRAPHIC
1.3.3

EXIT
1.3.4

EXIT
1.4

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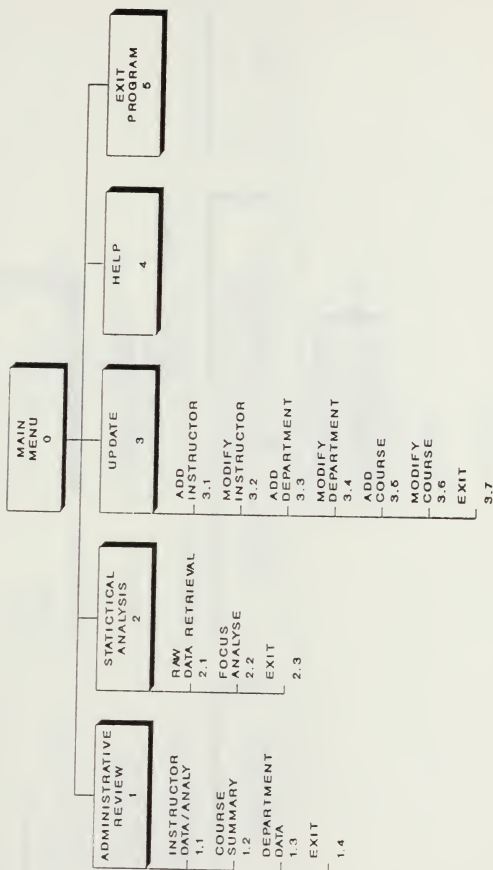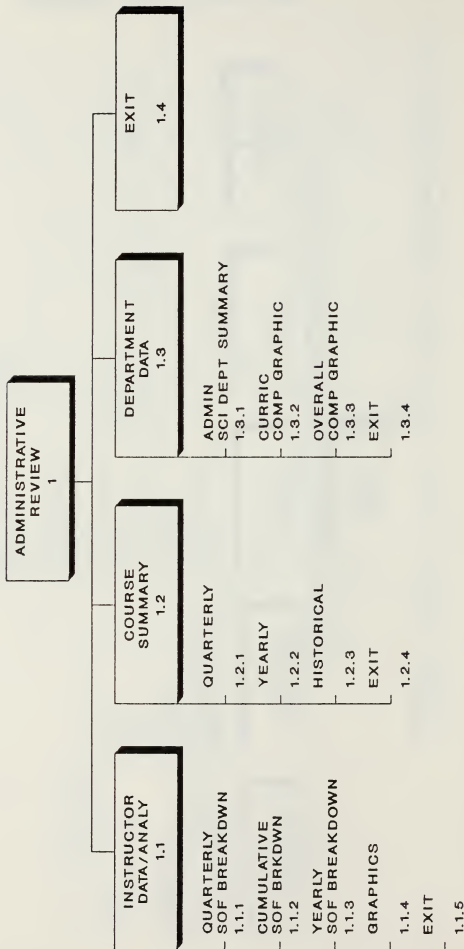
GRAPHICS

1.1.4

SPECIFIED
QUESTION
1.1.4.1

CURRICULUM
COMPARISON
1.1.4.2

OVERALL
COMPARISON
1.1.4.3

EXIT

1.1.4.4

STATICTICAL ANALYSIS 2

RAW DATA RETRIEVAL 2.1

QUARTERLY 2.1.1

YEARLY 2.1.2

CUMULATIVE 2.1.3

EXIT 2.1.4

FOCUS ANALYSE 2.2

COURSE 2.2.1

COURSE/CURRIC 2.2.2

DEPT 2.2.3

EXIT 2.2.4

EXIT 2.3
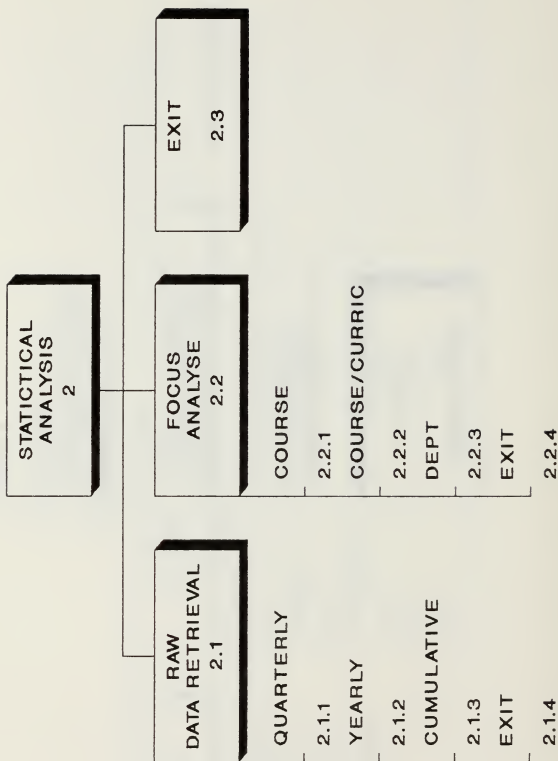
UPDATE

3

ADD
INSTRUCTOR
3.1

MODIFY
INSTRUCTOR
3.2

ADD
DEPARTMENT
3.3

MODIFY
DEPARTMENT
3.4

ADD
COURSE
3.5

MODIFY
COURSE
3.6

EXIT
3.7

APPENDIX G

SOFA PSEUDO CODE

1.1.1

Instructor Quarterly SOF Breakdown

```
ENTER INSTRUCTOR CODE, QUARTER AND THE YEAR;
PRINT REPORT HEADING;
     WITH QUARTER, YEAR AND LASTNAME;
     WITH STUDENT COUNT;
     BY SOF NUMBER;
     BY CURRICULUM;
END OF HEADING;
COUNT THE NUMBER OF INSTANCES OF QUESTIONS IN TOTAL;
COMPUTE FOR QUESTIONS 1 TO 20;
     PERCENT OF RESPONSES EQUAL TO 0 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 1 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 2 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 3 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 4 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 5 AND PRINT;
     AVERAGE OF QUESTION RESPONSES AND PRINT;
     STANDARD DEVIATION OF THE MEAN AND PRINT;
     CALCULATE MEDIAN AND PRINT;
END;
```

1.1.2

Instructor Cumulative SOF Breakdown

```
ENTER INSTRUCTOR CODE AND YEAR;
PRODUCE REPORT HEADING;
COUNT NUMBER OF INSTANCES OF EACH QUESTION;
COMPUTE
     THE SUM OF INSTANCES OF QUESTION ONE THROUGH
     QUESTION ELEVEN; DIVIDE THE SUM OF INSTANCES OF
     QUESTION 1 TO 11 BY THE COUNT
         TO GIVE THE AVERAGE OF QUESTIONS 1 TO 11
         AND PRINT;
COMPUTE
     THE MEDIAN FOR QUESTIONS 1 TO 11 AND PRINT;
     THE AVERAGE OF QUESTION 12 AND PRINT;
     THE MEDIAN OF QUESTION 12 AND PRINT;
     THE AVERAGE OF QUESTION 13 AND PRINT;
     THE MEDIAN OF QUESTION 13 AND PRINT;
END;
```

Instructor yearly SOF Breakdown

```
ENTER INSTRUCTOR CODE AND THE YEAR;
PRINT REPORT HEADING;
     WITH YEAR AND LASTNAME;
     WITH STUDENT COUNT;
END OF HEADING;
COUNT THE NUMBER OF INSTANCES OF QUESTIONS IN TOTAL;
COMPUTE FOR QUESTIONS 1 TO 20;
     PERCENT OF RESPONSES EQUAL TO 0 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 1 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 2 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 3 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 4 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 5 AND PRINT;
     AVERAGE OF QUESTION RESPONSES AND PRINT;
     STANDARD DEVIATION OF THE MEAN AND PRINT;
     CALCULATE MEDIAN AND PRINT;
END;
```

1.1.4.1

Specified Question Graphic

```
ENTER INSTRUCTOR CODE AND THE QUESTION NUMBER;
PRINT GRAPH HEADING;
COMPUTE
     THE AVERAGE OF THE SPECIFIED QUESTION AND PLOT;
     THE AVERAGE OF QUESTION TWELVE AND PLOT;
PRINT FOOTING WITH INSTRUCTOR'S LAST NAME;
END;
```

1.1.4.2

Curriculum Comparison

```
ENTER INSTRUCTOR CODE, YEAR AND CURRICULUM NUMBERS;
PRINT GRAPH HEADING;
COMPUTE
     THE AVERAGE OF QUESTION TWELVE FOR EACH CURRICULUM AND
     PLOT;
     PRINT FOOTING WITH INSTRUCTOR'S LAST NAME;
END;
```

1.1.4.3

Overall Comparison Graphic

```
ENTER INSTRUCTOR CODE AND THE CURRENT YEAR;
PRINT GRAPH HEADING;
COUNT NUMBER OF INSTANCES OF QUESTION 1 TO 12;
COMPUTE
     THE SUM OF INSTANCES OF QUESTION ONE THROUGH QUESTION
     ELEVEN;
     DIVIDE THE SUM OF INSTANCES OF QUESTION 1 TO 11 BY THE
     COUNT
     TO GIVE THE AVERAGE OF QUESTIONS 1 TO 11 AND PLOT;
COMPUTE
     THE AVERAGE OF QUESTION 12 AND PLOT;
PRINT HEADING WITH INSTRUCTOR'S LAST NAME;
END;
```

1.2.1

Quarterly Course Summary

```
ENTER THE COURSE NUMBER, QUARTER AND THE YEAR;
PRINT HEADING WITH DEPARTMENT NAME, QUARTER, YEAR AND
COURSE NUMBER;
COUNT THE NUMBER OF STUDENTS BY CURRICULUM AND PRINT LIST;
END HEADING;
COUNT NUMBER OF INSTANCES OF EACH QUESTION FOR QUESTIONS 1
TO 13;
COMPUTE
     THE SUM OF INSTANCES OF QUESTION ONE THROUGH QUESTION
     ELEVEN;
     DIVIDE THE SUM OF INSTANCES OF QUESTION 1 TO 11 BY THE
     COUNT TO GIVE THE AVERAGE OF QUESTIONS 1 TO 11  AND
     PRINT;
COMPUTE
     THE MEDIAN FOR QUESTIONS 1 TO 11 AND PRINT;
     THE AVERAGE OF QUESTION 12 AND PRINT;
     THE MEDIAN OF QUESTION 12 AND PRINT;
     THE AVERAGE OF QUESTION 13 AND PRINT;
     THE MEDIAN OF QUESTION 13 AND PRINT;
END;
```

Yearly Course Summary

```
ENTER THE COURSE NUMBER AND YEAR;
PRINT HEADING WITH DEPARTMENT NAME, YEAR AND COURSE NUMBER;
COUNT THE NUMBER OF STUDENTS BY CURRICULUM AND PRINT LIST;
END HEADING;
COUNT NUMBER OF INSTANCES OF EACH QUESTION FOR QUESTIONS 1
TO 13;
COMPUTE
     THE SUM OF INSTANCES OF QUESTION ONE THROUGH QUESTION
     ELEVEN;
     DIVIDE THE SUM OF INSTANCES OF QUESTION 1 TO 11 BY THE
     COUNT TO GIVE THE AVERAGE OF QUESTIONS 1 TO 11  AND
     PRINT;
COMPUTE
     THE MEDIAN FOR QUESTIONS 1 TO 11 AND PRINT;
     THE AVERAGE OF QUESTION 12 AND PRINT;
     THE MEDIAN OF QUESTION 12 AND PRINT;
     THE AVERAGE OF QUESTION 13 AND PRINT;
     THE MEDIAN OF QUESTION 13 AND PRINT;
END;
```

1.2.3

Course Summary, Historical

```
ENTER THE COURSE NUMBER;
PRINT HEADING WITH DEPARTMENT NAME AND COURSE NUMBER;
COUNT THE NUMBER OF STUDENTS BY CURRICULUM AND PRINT LIST;
END HEADING;
COUNT NUMBER OF INSTANCES OF EACH QUESTION FOR QUESTIONS 1
TO 13;
COMPUTE
     THE SUM OF INSTANCES OF QUESTION ONE THROUGH QUESTION
     ELEVEN;
     DIVIDE THE SUM OF INSTANCES OF QUESTION 1 TO 11 BY THE
     COUNT TO GIVE THE AVERAGE OF QUESTIONS 1 TO 11  AND
     PRINT;
COMPUTE
     THE MEDIAN FOR QUESTIONS 1 TO 11 AND PRINT;
     THE AVERAGE OF QUESTION 12 AND PRINT;
     THE MEDIAN OF QUESTION 12 AND PRINT;
     THE AVERAGE OF QUESTION 13 AND PRINT;
     THE MEDIAN OF QUESTION 13 AND PRINT;
END;
```

1.3.1

Administrative Sciences Dept. Summary

```
ENTER DEPARTMENT CODE, QUARTER AND THE YEAR;
PRINT REPORT HEADING;
     WITH DEPARTMENT, QUARTER, AND YEAR;
     WITH SOF NUMBER COUNT AND TOTAL RESPONDENT COUNT;
END OF HEADING;
COUNT THE NUMBER OF INSTANCES OF QUESTIONS IN TOTAL;
COMPUTE FOR QUESTIONS 1 TO 20;
     PERCENT OF RESPONSES EQUAL TO 0 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 1 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 2 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 3 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 4 AND PRINT;
     PERCENT OF RESPONSES EQUAL TO 5 AND PRINT;
     AVERAGE OF QUESTION RESPONSES AND PRINT;
     STANDARD DEVIATION OF THE MEAN AND PRINT;
     CALCULATE MEDIAN AND PRINT;
END;
```

1.3.2

Curriculum Comparison Graphic

```
ENTER CURRICULUM CHOICES AND DEPARTMENT NAME AND THE YEAR;
PRINT GRAPH HEADING;
COMPUTE
     THE AVERAGE OF QUESTION TWELVE BY CURRICULUM AND PLOT;
ACROSS QUARTER;
ACROSS YEAR;
PRINT FOOTING WITH INSTRUCTOR'S LAST NAME;
END;
```

1.3.3

Overall Comparison Graphic

```
ENTER INSTRUCTOR CODE, YEAR AND CURRICULUM NUMBER;
PRINT GRAPH HEADING;
COMPUTE
     THE AVERAGE OF QUESTION TWELVE AND PLOT;
ACROSS QUARTER;
ACROSS YEAR;
PRINT FOOTING WITH INSTRUCTOR'S LAST NAME;
END;
```

2.1.1

Quarterly Raw Data Retrieval

```
ENTER DEPARTMENT CODE, QUARTER AND YEAR;
PRINT HEADING WITH DEPARTMENT CODE, QUARTER AND YEAR;
PRINT RESPONSES TO ALL QUESTIONS;
COPY OUTPUT TO USER DISK ON MAINFRAME OR PRINTOUT;
END;
```

2.1.2

Yearly Raw Data Retrieval

```
ENTER DEPARTMENT CODE AND YEAR;
PRINT HEADING WITH DEPARTMENT CODE AND YEAR;
PRINT RESPONSES TO ALL QUESTIONS;
COPY OUTPUT TO USER DISK ON MAINFRAME OR PRINTOUT;
END;
```

2.1.3

Cumulative Raw Data Retrieval

```
ENTER DEPARTMENT CODE;
PRINT HEADING WITH DEPARTMENT CODE;
PRINT RESPONSES TO ALL QUESTIONS;
IF DEPARTMENT CODE;
COPY OUTPUT TO USER DISK ON MAINFRAME OR PRINTOUT;
END;
```

2.2.1

Course Focus Analyse

```
ENTER THE COURSE NUMBER, QUARTER AND YEAR;
PRINT RESPONSES TO QUESTIONS 1 THROUGH 20;
SAVE DATA IN TEMPORARY FOCUS FILE;
ENTER FOCUS ANALYSE;
    SELECT OPTIONS FROM FOCUS MENU;
PERFORM ANALYSIS ON TEMPORARY FILE;
END;
```

Course/Curriculum Focus Analyse

```
ENTER THE CURRICULUM, COURSE NUMBER, QUARTER AND YEAR;
PRINT RESPONSES TO QUESTIONS 1 THROUGH 20;
SAVE DATA IN TEMPORARY FOCUS FILE;
ENTER FOCUS ANALYSE;
    SELECT OPTIONS FROM FOCUS MENU;
PERFORM ANALYSIS ON TEMPORARY FILE;
END;
```

Department Focus Analyse

```
ENTER THE DEPARTMENT CODE, QUARTER AND YEAR;
PRINT RESPONSES TO QUESTIONS 1 THROUGH 20;
SAVE DATA IN TEMPORARY FOCUS FILE;
ENTER FOCUS ANALYSE;
    SELECT OPTIONS FROM FOCUS MENU;
PERFORM ANALYSIS ON TEMPORARY FILE;
END;
```

Add Instructor

```
ENTER THE DEPARTMENT CODE, LASTNAME, INITIALS AND
CONFIDENTIAL CODE;
MATCH DEPARTMENT CODE AND LAST NAME AGAINST DEPARTMENT
DATABASE;
IF NOT PRESENT, INCLUDE THE NEW TRANSACTION
    ELSE REJECT THE TRANSACTION;
END;
```

Modify Instructor

```
ENTER INSTRUCTOR'S LAST NAME, INSTRUCTOR CODE, AND
DEPARTMENT CODE;
MATCH DEPARTMENT CODE AGAINST DEPARTMENT DATABASE
    IF PRESENT CONTINUE
    IF NOT PRESENT ISSUE WARNING AND REJECT;
    MATCH INSTRUCTOR'S LAST NAME
        IF PRESENT DISPLAY INSTRUCTOR RECORD
        IF NOT PRESENT ISSUE WARNING AND REJECT;
    UPDATE THE FIELDS ON DISPLAYED RECORD;
END;
```

Add Department

```
ENTER THE DEPARTMENT CODE, DEPARTMENT NAME, AND CHAIRMAN'S
NAME;
MATCH DEPARTMENT CODE TO DEPARTMENT DATABASE
     IF DEPARTMENT CODE IS PRESENT
          ISSUE WARNING AND REJECT THE TRANSACTION
          ELSE INCLUDE THE TRANSACTION;
END;
```

3.4

Modify Department

```
ENTER DEPARTMENT CODE;
MATCH DEPARTMENT CODE AGAINST DEPARTMENT DATABASE
     IF DEPARTMENT CODE PRESENT DISPLAY DEPARTMENT RECORD;
     IF NOT PRESENT ISSUE WARNING AND REJECT THE
     TRANSACTION;
UPDATE THE FIELDS ON DISPLAYED RECORD;
END;
```

3.5

Add Course

```
ENTER THE COURSE NUMBER AND COURSE NAME;
MATCH COURSE NUMBER TO COURSES DATABASE
     IF COURSE NUMBER IS PRESENT
          ISSUE WARNING AND REJECT THE TRANSACTION
          ELSE INCLUDE THE TRANSACTION;
END;
```

3.6

Modify Course

```
ENTER COURSE NUMBER, QUARTER AND YEAR;
MATCH COURSE NUMBER AGAINST COURSES DATABASE
     IF COURSE NUMBER PRESENT DISPLAY COURSE RECORD;
     IF NOT PRESENT ISSUE WARNING AND REJECT THE
     TRANSACTION;
UPDATE THE FIELDS ON DISPLAYED RECORD;
END;
```

APPENDIX H

SOFA FORMS, MENUS AND REPORTS
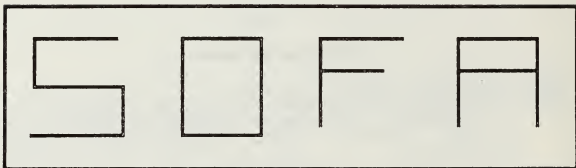
Student Opinion Form Analysis System

Designed and written by Richard C. Cecconi for the Administrative Sciences Department, Naval Post Graduate School. (1989)

PRESS ENTER TO CONTINUE OR (PF3) TO QUIT

NOTE: All of the menus, forms and reports in this appendix have the menu hierarchy level number directly below them. This has been included to allow the reader to trace the flow of the program while referencing Appendix F, the Menu Hierarchy.

```
                        SOFA
                     MAIN MENU

          1.  ADMINISTRATIVE REVIEW

          2.  STATISTICAL ANALYSIS

          3.  UPDATES

          4.  HELP

          5.  EXIT PROGRAM

          MAKE SELECTION AND PRESS ENTER:
     ======================================
              PRESS (PF3) TO QUIT SOFA
     ======================================
                     Level 0


                        SOFA

                 ADMINISTRATIVE REVIEW

          1.  INSTRUCTOR DATA AND ANALYSIS

          2.  COURSE SUMMARY

          3.  DEPARTMENT DATA

          4.  EXIT TO PREVIOUS MENU

          MAKE SELECTION AND PRESS ENTER:
     ======================================
              PRESS (PF3) TO QUIT SOFA
     ======================================
                     Level 1
```

SOFA
INSTRUCTOR DATA AND ANALYSIS

1. QUARTERLY SOF BREAKDOWN

2. YEARLY SOF BREAKDOWN

3. CUMULATIVE SOF BREAKDOWN

4. GRAPHICS

5. EXIT TO PREVIOUS MENU

MAKE SELECTION AND PRESS ENTER:
```
=======================================
     PRESS (PF3) TO QUIT SOFA
=======================================
```
Level 1.1

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

ADMINISTRATIVE SCIENCES DEPT
AT 89
QTR1

THE FOLLOWING STATISTICS ARE BASED ON:

COURSE	SOF #	CURRIC	COUNT
154183	161	365	2
		367	23
		998	1
*TOTAL SOFNO 161			26
	162	365	20
		620	2
*TOTAL SOFNO 162			22
TOTAL			48

QUESTION	N/A	1	2	3	4	5	MEAN	SD
1 THE COURSE WAS WELL ORGANIZED	.00	.00	.04	.00	.56	.44	4.52	.50
2 TIME IN CLASS WAS SPENT EFFECTIVELY	.00	.00	.04	.20	.50	.25	4.10	.80
3 INSTRUCTOR SEEMED TO KNOW WHEN STUDENTS DID NOT UNDERSTAND THE MATERIAL	.00	.00	.04	.26	.47	.23	3.98	.80
4 DIFFICULT CONCEPTS HERE MADE UNDERSTANDABLE	.00	.00	.00	.18	.52	.30	4.21	.64
5 I HAD CONFIDENCE IN THE INSTRUCTOR'S KNOWLEDGE OF THE SUBJECT	.00	.00	.00	.03	.24	.73	4.75	.48
6 I FELT FREE TO ASK QUESTIONS	.00	.00	.00	.11	.37	.72	4.58	.61
7 INSTRUCTOR WAS PREPARED FOR CLASS	.00	.00	.00	.00	.21	.79	4.83	.37
8 THE INSTRUCTOR'S OBJECTIVE FOR THE COURSE HAVE BEEN MADE CLEAR	.00	.00	.00	.03	.41	.57	4.60	.53
9 THE INSTRUCTOR MADE THIS COURSE A WORTHWHILE LEARNING EXPERIENCE	.00	.00	.00	.12	.53	.35	4.27	.64
10 THE INSTRUCTOR STIMULATED MY INTEREST IN THE SUBJECT AREA	.00	.00	.02	.20	.45	.33	4.15	.79
11 INSTRUCTOR CARED ABOUT STUDENT PROGRESS AND DID HIS SHARE IN HELPING US TO LEARN	.00	.00	.00	.13	.44	.43	4.42	.67

QUESTION	N/A	P	F	A	E	0	MEAN	SD
12 OVERALL, I WOULD RATE THIS INSTRUCTOR	.00	.00	.00	.21	.48	.31	4.15	.71
13 OVERALL, I WOULD RATE THIS COURSE	.00	.00	.00	.10	.46	.25	3.98	.75
14 OVERALL, I WOULD RATE THE TEXTBOOK(S)	.00	.01	.01	.10	.65	.18	3.98	.67
15 OVERALL, I WOULD RATE THE QUALITY OF EXAMS	.00	.04	.10	.43	.26		3.60	.99
16 OVERALL, I WOULD RATE THE LABORATORIES	.93	xxx	.00	.00	.00	.00	1.00	.00

OPTIONAL

	N/A	P	F	A	E	0	MEAN	SD
17	.00	xxx	.00	x	.00	.00	4.00	.00
18	xxx	.00	.00	.00	.00	.00		.00
19	xxx	.00	.00	.00	.00	.00		.00
20	xxx	.00	.00	.00	.00	.00		.00

```
                              SOFA
                INSTRUCTOR CUMULATIVE SOF BREAKDOWN

                  ENTER 3 DIGIT INSTRUCTOR CODE:

            ENTER THE LAST 2 DIGITS OF THE YEAR OR (ALL):

                            Level 1.1.2

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------


                    ADMINSTRATIVE SCIENCES DEPT
                    SOF BREAKDOWN FOR PROF. JOE DOKES
                       (Could be for Selected year)

CUMULATIVE
QUARTER  COURSE  SOF#  AVG.1-11 MED.  AVG.12 MED.  AVG.13 MED.
─────────────────────────────────────────────────────────────
Sum 88   IS-2000  134     3        4      3      4      3      4
```

```
                              SOFA
              INSTRUCTOR YEARLY SOF BREAKDOWN

              ENTER THE 3 DIGIT INSTRUCTOR CODE:

              ENTER THE LAST 2 DIGITS OF THE YEAR:

                          Level 1.1.3

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

                    ADMINSTRATIVE SCIENCES DEPT
                             AY 88
                       Prof. Joe Dokes

These statistics have been derived form the following SOFs:
                        SOF#        Course
                        150         IS-3500
                        151         IS-3502
                         .            .
                         .            .
                         .            .

 There were a total of 150 respondents.

                          N/A  1  2  3  4  5  Mean S.D. Med.
1.The course was well organized  ( % of respones received )
2.Time in class was well spent
3.
4.
5.


                              SOFA
                INSTRUCTOR ANALYSIS GRAPHICS

              1.   OVERALL COMPARISON

              2.   SPECIFIED QUESTION

              3.   CURRICULUM COMPARISON

              4.   EXIT TO PREVIOUS MENU

             MAKE SELECTION AND PRESS ENTER:
             =======================================
                   PRESS (PF3) TO QUIT SOFA
             =======================================
                          Level 1.1.4

                             85
```

SOFA
INSTRUCTOR OVERALL AVERAGE

ENTER THE 3 DIGIT INSTRUCTOR CODE:

ENTER THE LAST 2 DIGITS OF THE YEAR:

Level 1.1.4.3

--------SCREEN CLEARS AND THE FOLLOWING GRAPH IS PRODUCED------
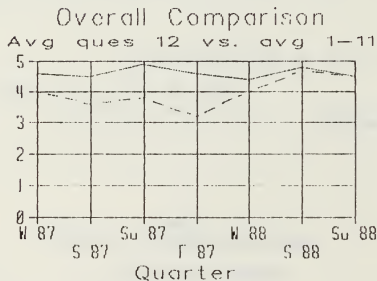
SOFA CURRICULUM COMPARISON

ENTER THE 3 DIGIT INSTRUCTOR CODE:

ENTER THE DESIRED CURRICULUM:

Level 1.1.4.2

--------SCREEN CLEARS AND THE FOLLOWING GRAPH IS PRODUCED------
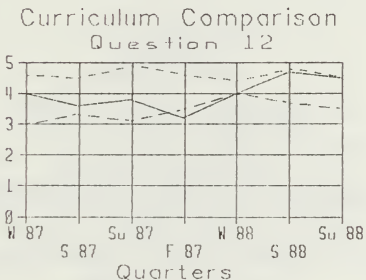
SPECIFIED QUESTION

ENTER INSTRUCTOR NAME:

ENTER QUESTION NUMBER:

Level 1.1.4.1

--------SCREEN CLEARS AND THE FOLLOWING GRAPH IS PRODUCED------
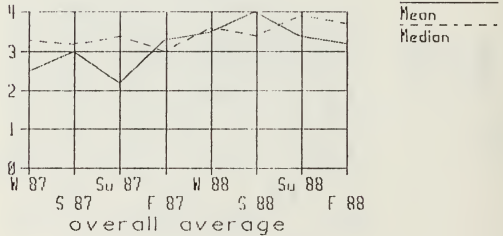
```
                        SOFA
                   COURSE SUMMARY

           1.   QUARTERLY

           2.   YEARLY

           3.   HISTORICAL

           4.   EXIT TO PREVIOUS MENU

        MAKE SELECTION AND PRESS ENTER:
     =======================================
           PRESS (PF3) TO QUIT SOFA
     =======================================
                   Level 1.2


                        SOFA
                     HISTORICAL
                   COURSE SUMMARY

        ENTER THE COURSE OF INTEREST:
        (EXAMPLE: IS2000 WITH NO DASH)

     ===============================================
              USE (PF3) TO QUIT SOFA
        WHEN THE FIELD IS CORRECT PRESS (ENTER)
     ===============================================
                   Level 1.2.3
```

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

<u>IS-2000</u> <u>AY 88</u>

Curric. 367   Students 23

<u>SOF</u>	INS.Code	Avg 1-11 Med	Avg 12 Med	Avg 13 Med

89

SOFA
QUARTERLY
COURSE ANALYSIS

ENTER THE COURSE OF INTEREST:
(EXAMPLE: IS0000 WITH NO DASH)

ENTER THE QUARTER OF INTEREST:
(EXAMPLE: FALL, WINTER, SPRING, SUMMER)

ENTER THE LAST 2 DIGITS OF THE YEAR:

===
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD. WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
            WHEN FINISHED, PRESS THE (PF3) KEY
===
Level 1.2.1

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

IS-2000 Sum 88
Curric. 367   Students 23

SOF	INS.Code	Avg 1-11 Med	Avg 12 Med	Avg 13 Med

```
                            SOFA
                HISTORICAL   COURSE ANALYSIS

                ENTER THE COURSE OF INTEREST:
                (EXAMPLE: IS0000 WITH NO DASH)

                        Level 1.2.3

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

                    IS-2000 Historical Summary
                    Curric. 367   Students 23
```

SOF	INS.Code	Avg 1-11 Med	Avg 12 Med	Avg 13 Med

```
                            SOFA
                      DEPARTMENT DATA

            1.   ADMINISTRATIVE SCIENCES DEPARTMENT SUMMARY

            2.   CURRICULUM COMPARISON GRAPHIC

            3.   OVERALL COMPARISON GRAPHIC

            4.   EXIT TO PREVIOUS MENU

            MAKE SELECTION AND PRESS ENTER:
            =====================================
                 PRESS (PF3) TO QUIT SOFA
            =====================================
                        Level 1.3
```

```
                              SOFA
             ADMINISTRATIVE SCIENCES DEPARTEMT SUMMARY

                   ENTER THE DEPARTMENT CODE:

                 ENTER THE QUARTER OF INTEREST:
                (EXAMPLE: FALL, WINTER, SPRING, SUMMER)

             ENTER THE LAST 2 DIGITS OF THE CURRENT YEAR:

================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
               WHEN FINISHED, PRESS THE (PF3) KEY
================================================================
                           Level 1.3.1

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

                   ADMINSTRATIVE SCIENCES DEPT

            The following statistics are derived from
                           SUM 88

                 The range of SOF#s is 140 - 219
          There were 49 sets of SOF#s and 1088 respondents

                         N/A  1  2  3  4  5  Mean S.D. Med.
1.The course was well organized   ( % of respones received )
2.Time in class was well spent
3.
4.
5.
```

ENTER THE LAST 2 DIGITS OF THE YEAR OR ALL:

(NOTE: IF NO YEAR IS SELECTED, CUMULATIVE DATA WILL BE DISPLAYED)

Levels 2.1.2 and 2.1.3

--------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------

ADMINISTRATIVE SCIENCES DEPT
RAW SOF DATA AY 89

<u>Qtr</u> <u>Instructor</u> <u>Code</u>

SOF	COURSE	CURRIC	CLSIZE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

SOFA
FOCUS ANALYSE

1.   COURSE ANALYSIS

2.   CURRICULUM VS COURSE ANALYSIS

3.   QUARTERLY DEPARTMENT ANALYSIS

4.   EXIT TO PREVIOUS MENU

MAKE A SELECTION AND PRESS ENTER:

```
==================================
    USE (PF3) TO QUIT SOFA
==================================
```
Level 2.2

```
                            SOFA
                          STATISTICS

                   1.   RAW DATA RETRIEVAL

                   2.   FOCUS ANALYSE

                   3.   EXIT TO PREVIOUS MENU

               MAKE SELECTION AND PRESS ENTER:
           ======================================
               PRESS (PF3) TO QUIT SOFA
           ======================================
                          Level 2

                            SOFA
                    QUARTERLY RAW DATA

                 ENTER THE DEPARTMENT CODE:

       TO ENTER THE QUARTER, USE THE FOLLOWING:
                       1 FOR FALL
                       2 FOR WINTER
                       3 FOR SPRING
                       4 FOR SUMMER
               ENTER THE QUARTER OF INTEREST:
               ENTER THE LAST 2 DIGITS OF THE YEAR:

    ================================================================
    USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
    ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
           WHEN FINISHED, PRESS THE (PF-1) KEY
    ================================================================

                        Level 2.1.1

      --------SCREEN CLEARS AND THE FOLLOWING REPORT IS PRODUCED------
```

                    ADMINISTRATIVE SCIENCES DEPT
                    RAW SOF DATA AY <u>89</u> QTR <u>3</u>

<u>Qtr Instructor Code</u>

<u>SOF</u>	<u>COURSE</u>	<u>CURRIC</u>	<u>CLSIZE</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>	<u>16</u>	<u>17</u>	<u>18</u>	<u>19</u>	<u>20</u>

DEPARTMENT OVERALL AVERAGE GRAPHIC

ENTER THE DEPARTMENT CODE:

ENTER THE LAST 2 DIGITS OF THE CURRENT YEAR:

==
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD. WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
            WHEN FINISHED, PRESS THE (PF-1) KEY
==
                       Level 1.3.3

--------SCREEN CLEARS AND THE FOLLOWING GRAPH IS PRODUCED------
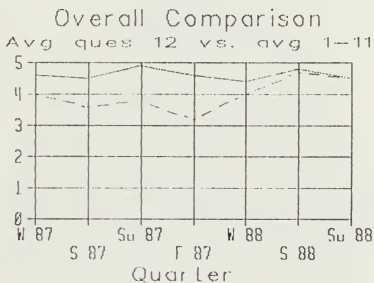
SOFA
DEPARTMENT CURRICULUM COMPARISON GRAPHIC

ENTER THE DEPARTMENT CODE:

ENTER THE LAST 2 DIGITS OF THE CURRENT YEAR:

ENTER THE FIRST CURRICULUM:
ENTER THE SECOND CURRICULUM:
ENTER THE THIRD CURRICULUM:

==
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD. WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
WHEN FINISHED, PRESS THE (PF-1) KEY
==
Level 1.3.2

--------SCREEN CLEARS AND THE FOLLOWING GRAPH IS PRODUCED------

93
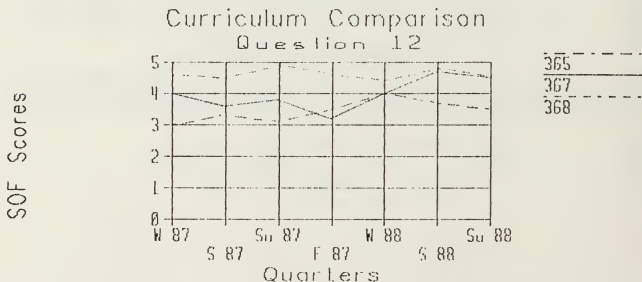
```
                         SOFA
                   COURSE ANALYSIS

          ENTER THE QUARTER OF INTEREST:
        (EXAMPLE: FALL, WINTER, SPRING, SUMMER)

            ENTER THE COURSE OF INTEREST:
            (EXAMPLE: IS0000 WITH NO DASH)

        ENTER THE LAST 2 DIGITS OF THE YEAR:

=========================================================
     USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD
     WHEN THE FIELDS ARE CORRECT, PRESS (ENTER)
                  PRESS (PF3) TO QUIT
=========================================================
                    Level 2.2.1


                         SOFA
                   CURRICULUM TO
                   COURSE ANALYSIS

          ENTER THE CURRICLUM TO ANALYSE:

            ENTER THE COURSE OF INTEREST:
            (EXAMPLE: IS0000 WITH NO DASH)

        ENTER THE LAST 2 DIGITS OF THE YEAR:

=================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
        WHEN FINISHED, PRESS THE (PF-1) KEY
=================================================================
                    Level 2.2.2
```

```
                              SOFA
                           QUARTERLY
                      DEPARTMENT ANALYSIS

                 ENTER THE DEPARTMENT OF INTEREST:

                  ENTER THE QUARTER OF INTEREST:
               (EXAMPLE: FALL, WINTER, SPRING, SUMMER)

              ENTER THE LAST TWO DIGITS OF THE YEAR:

      =================================================================
      USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
      ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
                   WHEN FINISHED, PRESS THE (PF-1) KEY
      =================================================================
                            Level 2.2.3


STATISTICAL OPERATIONS...
ANOVA    CORRE    EXPLAIN  EXSMO   FACTO    MDISC   MULTR
POLRG    STATS    STATSET  STEPR   TIMESER  XTABS   FILESIZE

NOTE: When FOCUS Analyse is selected this menu is presented.  These are the
statistical funtions available to FOCUS.  They are selected typing the name of
the desired funtion and pressing (ENTER).




                           SOFA UPDATES

                        1.  ADD INSTRUCTOR
                        2.  MODIFY INSTRUCTOR
                        3.  ADD DEPARTMENT
                        4.  MODIFY DEPARTMENT
                        5.  ADD COURSE
                        6.  MODIFY COURSE
                        7.  EXIT TO PREVIOUS MENU

                MAKE SELECTION AND PRESS ENTER:
                =====================================
                     PRESS (PF3) TO QUIT SOFA
                =====================================
                            Level 3
```

ADD **AN** INSTRUCTOR

ENTER THE DEPARTMENT CODE:

ENTER THE LAST NAME:

ENTER THE INSTRUCTOR'S INITIALS:

ENTER THE INSTRUCTOR'S CONFIDENTIAL CODE:

```
=================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
             WHEN FINISHED, PRESS THE (PF3) KEY
=================================================================
```
Level 3.1

MODIFY INSTRUCTOR
CODE

ENTER THE INSTRUCTOR'S LAST NAME:

ENTER THE INSTRUCTOR'S CONFIDENTIAL CODE:

AND THE DEPARTMENT CODE:

```
=================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
             WHEN FINISHED, PRESS THE (PF3) KEY
=================================================================
```
Level 3.2

----SCREEN CLEARS AND THE REQUESTED RECORD IS DISPLAYED----

MODIFY INSTRUCTOR
CODE

LAST NAME: CECCONI   INITIALS: RC

DEPARTMENT: 54

CONFIDENTIAL CODE: 200

```
=================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
             WHEN FINISHED, PRESS THE (PF3) KEY
=================================================================
```

```
                    ADD DEPARTMENT

              ENTER THE DEPARTMENT CODE:

              ENTER THE DEPARTMENT NAME:

              ENTER THE CHAIRMAN'S NAME:

================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
              WHEN FINISHED, PRESS THE (PF3) KEY
================================================================

                       Level 3.3

                   MODIFY DEPARTMENT

              ENTER THE DEPARTMENT CODE:

================================================================
WHEN THE FIELD IS CORRECT, PRESS (ENTER) TO ACCESS THE DATABASE
================================================================
                       Level 3.4

   ----SCREEN CLEARS AND THE REQUESTED RECORD IS DISPLAYED----

                   MODIFY DEPARTMENT

                 DEPARTMENT CODE: 54

       DEPARTMENT NAME: ADMINISTRATIVE SCIENCES DEPT

         DEPARTMENT CHAIRMAN: WHIPPLE, DR

================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
              WHEN FINISHED, PRESS THE (PF-1) KEY
================================================================
```

ADD NEW COURSES

ENTER THE NEW COURSE NUMBER:

ENTER THE NEW COURSE NAME:

```
================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
            WHEN FINISHED, PRESS THE (PF3) KEY
================================================================
```
Level 3.5

MODIFY COURSES

ENTER THE COURSE NUMBER:

ENTER THE QUARTER: AND THE YEAR:

```
================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
            WHEN FINISHED, PRESS THE (PF3) KEY
================================================================
```

Level 3.6

----SCREEN CLEARS AND THE REQUESTED RECORD IS DISPLAYED----

MODIFY COURSE

COURSE: IS4200   SECTION:02   SOF NUMBER: 100

COURSE NAME: SYSTEMS ANALYSIS AND DESIGN

QUARTER: 1   YEAR: 89

```
================================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE FIELDS
ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO THE DATABASE
            WHEN FINISHED, PRESS THE (PF3) KEY
================================================================
```

APPENDIX I

SOFA MASTER FILES

Department Master File

```
FILENAME=DEPT,          SUFFIX=FOC,$

SEGNAME=DEPT,           SEGTYPE=S1,$

FIELDNAME=DEPCODE  , ,FORMAT=A4 ,TITLE='CODE'        ,FIELDTYPE=I,$
FIELDNAME=DEPNAME  , ,FORMAT=A30,TITLE='DEPARTMENT'             ,$
FIELDNAME=CHAIRMAN , ,FORMAT=A20                                ,$

SEGNAME=INST,           SEGTYPE=S1,      PARENT=DEPT,$

FIELDNAME=LNAME  , ,FORMAT=A12                           ,$
FIELDNAME=CODE   , ,FORMAT=A3              ,FIELDTYPE=I,$
FIELDNAME=INIT   , ,FORMAT=A3                             ,$
FIELDNAME=USERID , ,FORMAT=A5                             ,$

SEGNAME=INSTSOF,        SEGTYPE=S3,       PARENT=INST,$

FIELDNAME=SOFNO  , ,FORMAT=A3  ,TITLE='SOF #'      ,FIELDTYPE=I,$
FIELDNAME=QUARTER, ,FORMAT=A1                               ,$
FIELDNAME=YR     , ,FORMAT=A2                               ,$
    FIELDNAME=SOFKEY , ,FORMAT=A6              ,INDEX = I

                  Courses Master File

FILENAME=COURSES,    SUFFIX=FOC,$

SEGNAME=COURSE,         SEGTYPE=S3,$

FIELDNAME=SOFNO  , ,FORMAT=A3,               FIELDTYPE=I,$
FIELDNAME=QUARTER, ,FORMAT=A1                          ,$
FIELDNAME=YR     , ,FORMAT=A2                          ,$
FIELDNAME=COURSE , ,FORMAT=A6                          ,$
FIELDNAME=SEG    , ,FORMAT=A2                          ,$
FIELDNAME=CSNAME , ,FORMAT=A30,TITLE='TITLE'          ,$
FIELDNAME=SOFKEY , ,FORMAT=A6,               INDEX=I   ,$

                  Sofs Master File

FILENAME=SOFS,          SUFFIX=FOC,$

SEGNAME=SOF,            SEGTYPE=S3,$
```

102

```
FIELDNAME=SOFNO    , ,FORMAT=A3                              ,FIELDTYPE=I,$
FIELDNAME=QUARTER, ,FORMAT=A1                                           ,$
FIELDNAME=YR       , ,FORMAT=A2                                         ,$
FIELDNAME=SOFKEY , ,FORMAT=A6                            ,INDEX = I    ,$

SEGNAME=SUBSOF,             SEGTYPE=S1,          PARENT=SOF,$

FIELDNAME=SSOFNO   , ,FORMAT=I3                              ,FIELDTYPE=I,$
FIELDNAME=CURRIC   , ,FORMAT=I3                                         ,$
FIELDNAME=HRSTHQTR, ,FORMAT=I2,MISSING=ON                               ,$
FIELDNAME=QTRCOMP , ,FORMAT=I2,MISSING=ON                               ,$
FIELDNAME=REQUIRED, ,FORMAT=I1                                          ,$
FIELDNAME=QUES1    , ,FORMAT=D5.2,TITLE='1',MISSING=ON                  ,$
FIELDNAME=QUES2    , ,FORMAT=D5.2,TITLE='2',MISSING=ON                  ,$
FIELDNAME=QUES3    , ,FORMAT=D5.2,TITLE='3',MISSING=ON                  ,$
FIELDNAME=QUES4    , ,FORMAT=D5.2,TITLE='4',MISSING=ON                  ,$
FIELDNAME=QUES5    , ,FORMAT=D5.2,TITLE='5',MISSING=ON                  ,$
FIELDNAME=QUES6    , ,FORMAT=D5.2,TITLE='6',MISSING=ON                  ,$
FIELDNAME=QUES7    , ,FORMAT=D5.2,TITLE='7',MISSING=ON                  ,$
FIELDNAME=QUES8    , ,FORMAT=D5.2,TITLE='8',MISSING=ON                  ,$
FIELDNAME=QUES9    , ,FORMAT=D5.2,TITLE='9',MISSING=ON                  ,$
FIELDNAME=QUES10   , ,FORMAT=D5.2,TITLE='10',MISSING=ON                 ,$
FIELDNAME=QUES11   , ,FORMAT=D5.2,TITLE='11',MISSING=ON                 ,$
FIELDNAME=QUES12   , ,FORMAT=D5.2,TITLE='12',MISSING=ON                 ,$
FIELDNAME=QUES13   , ,FORMAT=D5.2,TITLE='13',MISSING=ON                 ,$
FIELDNAME=QUES14   , ,FORMAT=D5.2,TITLE='14',MISSING=ON                 ,$
FIELDNAME=QUES15   , ,FORMAT=D5.2,TITLE='15',MISSING=ON                 ,$
FIELDNAME=QUES16   , ,FORMAT=D5.2,TITLE='16',MISSING=ON                 ,$
FIELDNAME=QUES17   , ,FORMAT=D5.2,TITLE='17',MISSING=ON                 ,$
FIELDNAME=QUES18   , ,FORMAT=D5.2,TITLE='18',MISSING=ON                 ,$
FIELDNAME=QUES19   , ,FORMAT=D5.2,TITLE='19',MISSING=ON                 ,$
FIELDNAME=QUES20   , ,FORMAT=D5.2,TITLE='20',MISSING=ON                 ,$
```

STUDENT OPINION FORM ANALYSIS
VERSION 1.0
USERS MANUAL

Introduction

The Student Opinion Form Analysis software is designed to be user friendly and functional. Its purpose is to allow the user to access historical data from courses, based on their sof number and the quarter and year. It has been implemented in FOCUS. FOCUS is a popular mainframe database management system and is run on the IBM 3033 mainframe at the Naval Postgraduate School. This manual assumes that the user is familiar with the CMS environment to the extent that the user is familiar with logging in and out, issuing directory commands, and screen clearing procedures. Its reporting features are easily learned should users decide to use interactive commands for ad hoc queries. Otherwise, the basic features of SOFA are menu driven.

The software is stored on the account of the chairman of the Administrative Sciences Department. In order to access the software, the user must have the user account number of the chairman.

Getting Started

The user must possess three pieces of information:

1. The chairman's account number. (This will be in the form of 9999P)

2. The read-only password of the chairman's account.

3. Your personal account on the NPS mainframe.

When you have these, you are ready to begin.

The following is a step-by-step walk through the procedure to access and begin the SOFA program.

1. Log on to your account on the NPS mainframe in the usual manner.

2. Once you are logged on, type the CMS command: "LINKTO 9999P" (chairman's account)

You will be asked for the read-only password. After entering the read-only password you will be admitted to the chairman's account, providing you used the correct password.

3. Type the following to access FOCUS:
"LINKTO FOCUS" (This will link you to FOCUS 6.0)

4. Type "FOCUS" (This starts FOCUS)

5. Type "EX MENUS" (This will initiate the SOFA program executable file)

6. Follow the menu prompts.

Getting Out

Once you are finished with SOFA, you will be returned to the FOCUS prompt. In order to return to CMS simply type "FIN" and press the ENTER key. This will return you to the CMS prompt. Log out of CMS as normal.

Menu Interaction

For all menus the user is offered a number for the option to select. The user simply enters the number and then presses the <ENTER> key and the selected option will execute.

Each menu will display on-screen help near the bottom which will look like the following:

```
========================================
          PRESS (PF3) TO QUIT SOFA
========================================
```

This will serve to remind the user they are free to back out of SOFA at any time. Pressing <PF3> will halt SOFA operations and return the user to the FOCUS prompt. If the user wishes to re-enter SOFA merely type EX MENUS, and the SOFA program will re-start.

Forms

Forms are used throughout SOFA which allow the user to query the database, add or modify records and produce reports in a way that will preserve the database integrity and guide the user. The screen will prompt the user for the desired inputs, and provide examples where required. For example in Figure 1, after selecting Add Instructor from the Update Menu, the user is presented with a form which will

ADD AN INSTRUCTOR

ENTER THE DEPARTMENT CODE:

ENTER THE LAST NAME:

ENTER THE INSTRUCTOR'S INITIALS:

ENTER THE INSTRUCTOR'S CONFIDENTIAL CODE:

```
==========================================================
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE
FIELDS ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO
THE DATABASE WHEN FINISHED, PRESS THE (PF3) KEY
==========================================================
```

Figure 1. Add Instructor

add a record to the database. The cursor will be positioned
at the first field, in this instance, "Enter the Department
Code." The user enters the two digit department code. The
form will allow only two digits and then the cursor will
move to the next field. Should the user not need all of the
space available in a field, press the <TAB> key and the
cursor moves to the next field. This continues until the
user has filled out all fields. The user then presses
enter, and the data becomes an instance in the SOFA
database. Then a blank record form will appear. When the
user is finished entering records, pressing <PF3> will
return the program to the previous menu. Notice that the
on-screen help at the bottom of the screen summarizes these
procedures.

WARNING: IF INCORRECT INFORMATION IS ENTERED, AN INCORRECT RECORD WILL EXIST IN THE DATABASE. EXTREME CAUTION MUST BE EXERCISED WHEN ADDING RECORDS TO THE DATABASE. THE INCORRECT RECORDS CAN ONLY BE PURGED USING A SEPARATE FOCUS ROUTINE BY DIRECTLY ACCESSING THE DATABASE.

In cases where there might possibly be confusion an example input is displayed just below the field, as shown in Figure 2.

<div align="center">

SOFA
COURSE ANALYSIS

ENTER THE COURSE OF INTEREST:
(EXAMPLE: IS0000 WITH NO DASH)

ENTER THE QUARTER OF INTEREST:
(EXAMPLE: FALL, WINTER, SPRING, SUMMER)

ENTER THE LAST 2 DIGITS OF THE YEAR:

</div>

```
===============================================================
 USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.  WHEN THE
FIELDS ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO
    THE DATABASE WHEN FINISHED, PRESS THE (PF3) KEY
===============================================================
```

Figure 2. SOFA Course Analysis

The user is given the example. When <ENTER> is pressed, the database will be searched for a records that match the user inputs, and a report will be produced.

NOTE: IF INCORRECT OR NONEXISTENT DATA IS INPUT A BLANK REPORT WILL BE PRODUCED!

Reports

Reports are all produced on the printer. The reason for this is that the physical size of the reports themselves

<div align="center">108</div>

cannot be reproduced on the CRT. Also, FOCUS handles the larger SOFA reports as a series of reports. When SOFA is producing reports, the user will be required to observe the screen and clear it as required. This may happen many times, depending on the report, and the amount of data being retrieved.

The forms to produce reports are displayed and used in the same fashion as described above. IT IS IMPORTANT TO REALIZE THAT IF INCORRECT QUERIES ARE MADE, OR NONEXISTENT DATA IS REQUESTED, THE REPORT WILL BE PRODUCED, BUT WILL BE BLANK.

SOFA Tutorial

This tutorial will take the user through one path of the menu hierarchy, and produce a report. It will use the same procedures that are used throughout the SOFA application.

The user will encounter the main menu first (Figure 3).

```
                    SOFA
                 MAIN MENU
           1.  ADMINISTRATIVE REVIEW
           2.  STATISTICAL ANALYSIS
           3.  UPDATES
           4.  HELP
           5.  EXIT PROGRAM

      MAKE SELECTION AND PRESS ENTER:
      =====================================
           PRESS (PF3) TO QUIT SOFA
      =====================================
```

Figure 3. SOFA Main Menu

The cursor is located at the end of the selection line. All the user is required to do is type the number of the selection and press enter. For the purposes of the tutorial, option 1 is selected. Option 1 displays the Administrative Review Menu (Figure 4). The procedure for selecting an option remains the same as the previous menu.

```
                          SOFA
                 ADMINISTRATIVE REVIEW

        1.   INSTRUCTOR DATA AND ANALYSIS
        2.   COURSE SUMMARY
        3.   DEPARTMENT DATA
        4.   EXIT TO PREVIOUS MENU

        MAKE SELECTION AND PRESS ENTER:
        =======================================
              PRESS (PF3) TO QUIT SOFA
        =======================================
```

Figure 4. SOFA Administrative Review Menu

Selecting option 1 will cause a menu to be displayed (Figure 5). Once again, the same procedure will be used to select an option from the menu. The selection of option 1 will a

```
                          SOFA

             INSTRUCTOR DATA AND ANALYSIS

        1.   QUARTERLY SOF BREAKDOWN
        2.   YEARLY SOF BREAKDOWN
        3.   CUMULATIVE SOF BREAKDOWN
        4.   GRAPHICS
        5.   EXIT TO PREVIOUS MENU

        MAKE SELECTION AND PRESS ENTER:
        =======================================
              PRESS (PF3) TO QUIT SOFA
        =======================================
```

Figure 5. Instructor Data/Analysis Menu

form which will guide the user through the reporting process Figure 6) . The user is prompted for inputs to the form which control the database query and through format and masking, they control the acceptable inputs. The user will input the 3 digit instructor confidential code and the cursor will automatically move to the quarter field. Enter the quarter as the example indicates. If the field is not full when you have completed the quarter, use the TAB key to move to the next field. Make sure that correct information is entered to insure that the resulting report is correct. Continue correct. Then press ENTER. Processing will begin and the report will be generated. It will not appear on the screen due to its size. You will notice the screen will display FOCUS information and the CMS "more" prompt appears. Clear the screen as you would for normal CMS processes. When the report is complete, the CMS virtual printer queuing statements will be displayed. Clear the screen again and the previous menu (Figure 5) will be displayed. The user

SOFA

INSTRUCTOR QUARTERLY SOF BREAKDOWN

ENTER THE 3 DIGIT INSTRUCTOR CODE:

ENTER THE QUARTER:

EXAMPLE: SUMMER, WINTER, FALL, SPRING)

ENTER THE LAST 2 DIGITS OF THE YEAR:

Figure 6. Instructor Quarterly SOF Breakdown Form

must then go to the computer center and retrieve the report from his usual pickup box. The report will be in a format similar to Figure 7.

<div align="center">

ADMINISTRATIVE SCIENCES DEPT
AY 88   QTR 3
Prof. Joe Dokes

The following statistics are based on

SOF# 150, IS-3502

Respondents by Curriculum:

367: 15
300: 5
368: 3

</div>

```
                      N/A 1  2  3  4  5  Mean S.D. Med.
1.  The course was well organized ( % of respones received
2.  Time in class was well spent
3.
4.
5.
```

Figure 7.   Instructor Quarterly SOF Breakdown Report

The procedures outlined above are the same for each selection in the Administrative Review, the Update selections and the Raw Data Retrieval. FOCUS Analyze is slightly different and will be explained in the next section.

<u>FOCUS Analyze Tutorial</u>

Selection of the Statistics from the main menu (Figure 3) will display the Statistics menu (Figure 8). Selection

```
                        SOFA

                     STATISTICS

               1.  RAW DATA RETRIEVAL
               2.  FOCUS ANALYZE
               3.  EXIT TO PREVIOUS MENU

           MAKE SELECTION AND PRESS ENTER:
         ======================================
              PRESS (PF3) TO QUIT SOFA
         ======================================
```

Figure 8. SOFA Statistics Menu

of option   2 will display another menu, FOCUS Analyze
(Figure 9). All of these menus utilize the same procedures
as the Administrative Review Section.

```
                       SOFA
                   FOCUS ANALYZE

          1.  COURSE ANALYSIS
          2.  CURRICULUM VS COURSE ANALYSIS
          3.  QUARTERLY DEPARTMENT ANALYSIS
          4.  EXIT TO PREVIOUS MENU

          MAKE A SELECTION AND PRESS ENTER:
        ===================================
              USE (PF3) TO QUIT SOFA
        ===================================
```

Figure 9. SOFA FOCUS Analyze Menu

SOFA Focus Analyze takes advantage of the statistical
analysis facility provided by FOCUS. It allows the user to
perform statistical operations directly on data retrieved by
the query forms in SOFA.   If option 1 (Figure 9) Course
Analysis is selected, the Course Analysis form (Figure 10)

SOFA

COURSE ANALYSIS

ENTER THE COURSE OF INTEREST:
(EXAMPLE: IS0000 WITH NO DASH)

ENTER THE QUARTER OF INTEREST:
(EXAMPLE: FALL, WINTER, SPRING, SUMMER)

ENTER THE LAST 2 DIGITS OF THE YEAR:

===
USE THE (TAB) KEY TO MOVE FROM FIELD TO FIELD.   WHEN THE
FIELDS ARE CORRECT, PRESS (ENTER) TO LOAD THE RECORD INTO
THE DATABASE WHEN FINISHED, PRESS THE (PF-1) KEY
===

Figure 10. SOFA Course Analysis Form

will be displayed. Fill in the fields as explained earlier,
and press ENTER.   Data will be retrieved and stored in a
temporary file.   The user will then be transferred into
FOCUS Analyze.   A menu displaying the statistical options
offered is displayed (Figure 11).   The options are selected
by typing the name of the desired function and pressing
ENTER.   Figure 12 shows what the abbreviations mean.   When
you are finished with the analysis, type "QUIT" and you will
be returned to the FOCUS Analyze menu.

```
STATISTICAL OPERATIONS...
ANOVA   CORRE   EXPLAIN   EXSMO   FACTO    MDISC   MULTR
POLRG   STATS   STATSET   STEPR   TIMESER  XTABS   FILESIZE
```
Figure 11. FOCUS Analyze Options

Subcommand	Statistical Operation
ANOVA	Analysis of variance
CORRE	Correlation Coefficient, standard deviation, mean, and number of observations
EXPLAIN	Documentation of ANALYZE functions
EXSMO	Triple exponential smoothing and forecasting
FACTO	Factor Analysis
MDISC	Discriminant analysis
MULTR	Multiple linear regression
POLRG	Polynomial regression
STATS	Descriptive statistics (modes, variances, deciles, quartiles, etc)
STATSET	Select processing of missing data, create an equation file, and prepare the environment
STEPR	Stepwise linear regression
TIMESER	Time Series Analysis
XTABS	Cross tabulation and summary statistics

Figure 12.   Summary of Statistical Operations

Special attention should be given to the EXPLAIN option.
This option offers an explanation of the function and can be
used as a help and reference for using the other options.

Additional Comments

The above guide would be all that is needed to operate
SOFA. The user will find that it is relatively easy to get
to know the system.

The database can be more valuable to users if they learn
more about the interactive commands for producing reports.
They can be found in the Focus manual and are quite easy to
learn and implement.   They will allow truly ad hoc queries
against the database.

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